



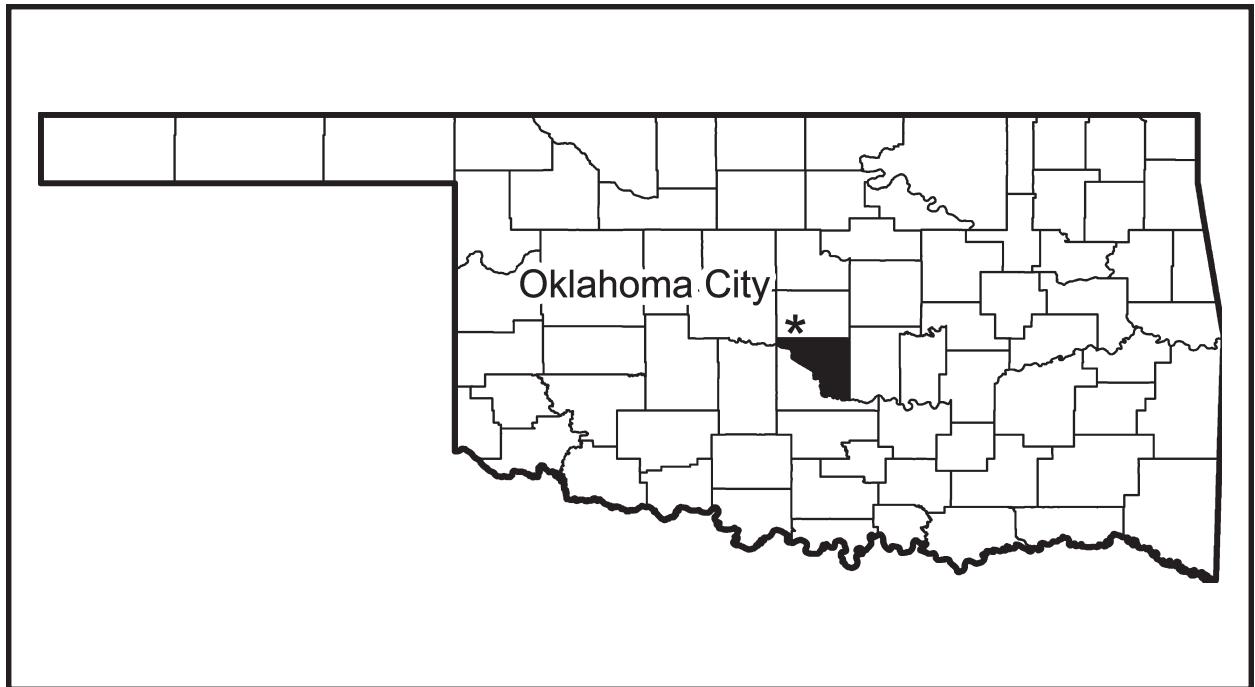
United States
Department of
Agriculture



NRCS
Natural
Resources
Conservation
Service

In cooperation with
the Oklahoma Agricultural
Experiment Station
and the
Oklahoma Conservation
Committee

Supplement to the Soil Survey of Cleveland County, Oklahoma



How To Use This Soil Survey Supplement

This document, in conjunction with the Web Soil Survey, supplements the Soil Survey of Cleveland County, Oklahoma, published in 1987. Find a map of your area of interest on the Web Soil Survey at <http://websoilsurvey.nrcs.usda.gov>. Note the map unit symbols in the area. Turn to the **Contents** in this supplement. The **Contents** lists the map units by symbol and name and shows the page where each map unit is described. Also see the **Contents** for sections of this publication that may address your specific needs.

Advancements in technology and increases in the intensity and variety of land uses have produced a need for updated soils information. In preparation for this publication, the correlation for the Soil Survey of Cleveland County was amended in February 1997 and January 2002. This publication and the Web Soil Survey include the recorrelated map unit legend and updated information regarding major soil properties and the use and management of the soils. In some cases, the name of the map unit and the name of the soil series have changed from the first publication. The map unit symbols and map delineations have not changed.

Web Soil Survey

The latest detailed soil maps and updated tabular data, including soil properties and interpretations, are available on the Web Soil Survey at <http://websoilsurvey.nrcs.usda.gov>.

Archived Soil Survey

Comprehensive descriptions of the detailed soil map units and additional information about the soils in the survey area are archived in the original Soil Survey of Cleveland County, Oklahoma. Archived soil surveys are available from many libraries, from the local office of the Natural Resources Conservation Service, and from the Cleveland County Conservation District in Norman, Oklahoma.

This document is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (formerly the Soil Conservation Service) has leadership for the Federal part of the National Cooperative Soil Survey.

Major fieldwork for the Soil Survey of Cleveland County, Oklahoma, was completed in 1982. Soil names and descriptions were approved in 1983. The soil database and maps were revised to current SSURGO criteria when the survey was digitized in 2004. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 2004. This survey was originally mapped at a scale of 1:20,000. The original hard-copy soil maps were recompiled, digitized at 1:24,000, and rectified to 1995 digital orthophraphy.

The survey was made cooperatively by the Natural Resources Conservation Service, the Oklahoma Agricultural Experiment Station, and the Oklahoma Conservation Commission. It is part of the technical assistance furnished to the Cleveland County Conservation District.

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Contents

How To Use This Soil Survey Supplement	i
Contents	iii
Foreword	vii
How Soil Surveys Are Made	2
General Nature of the Survey Area	3
Settlement and Development	3
Physiography, Relief, and Drainage	4
Natural Resources	5
Industry and Transportation	6
Climate	6
<i>Table 1.—Temperature and Precipitation</i>	7
<i>Table 2.—Freeze Dates in Spring and Fall</i>	8
<i>Table 3.—Growing Season</i>	8
Detailed Soil Map Units	9
<i>Table 4.—Acreage and Proportionate Extent of the Soils</i>	11
1—Stephenville-Darsil-Newalla complex, 3 to 8 percent slopes	13
2—Harrah fine sandy loam, 5 to 8 percent slopes	14
3—Grainola-Ashport complex, 0 to 8 percent slopes	15
4—Gracemore-Gaddy complex, 0 to 1 percent slopes, occasionally flooded	16
5—Harrah fine sandy loam, 5 to 8 percent slopes, gullied	17
6—Grainola-Ironmound complex, 5 to 12 percent slopes	18
7—Stephenville-Darsil complex, 1 to 5 percent slopes	19
8—Stephenville-Darsil-Newalla complex, 3 to 8 percent slopes, gullied	20
9—Kingfisher-Ironmound complex, 1 to 5 percent slopes	22
10—Teval silt loam, 3 to 8 percent slopes	23
11—Dougherty-Konawa complex, 3 to 8 percent slopes	24
12—Derby loamy fine sand, 0 to 3 percent slopes	25
13—Derby loamy fine sand, 3 to 15 percent slopes	26
14—Derby-Urban land complex, 3 to 15 percent slopes	27
15—Littleaxe loamy fine sand, 1 to 3 percent slopes	27
17—Gracemore silty clay loam, saline, 0 to 1 percent slopes, frequently flooded	28
18—Gracemore loamy fine sand, 0 to 1 percent slopes, frequently flooded	29
19—Goodnight loamy fine sand, 5 to 20 percent slopes	30
20—Tribbey fine sandy loam, 0 to 1 percent slopes, frequently flooded	30
21—Pits	31
28—Kingfisher-Urban land-Ironmound complex, 1 to 5 percent slopes	31
29—Ironmound very fine sandy loam, 5 to 8 percent slopes	33
30—Brewless silty clay loam, 0 to 1 percent slopes, rarely flooded	33
32—Lomill silty clay, 0 to 1 percent slopes, occasionally flooded	34
33—Norge-Ashport complex, 0 to 8 percent slopes	35
34—Brewless-Urban land complex, 0 to 1 percent slopes, rarely flooded	36
35—Stephenville-Darsil-Newalla complex, 3 to 8 percent slopes, eroded	37
36—Stephenville-Darsil complex, 1 to 5 percent slopes, eroded	39

37—Harrah fine sandy loam, 5 to 8 percent slopes, eroded	40
38—Asher-Urban land complex, 0 to 1 percent slopes, rarely flooded	41
39—Asher silt loam, 0 to 1 percent slopes, clayey substratum, rarely flooded	41
40—Asher silty clay loam, 0 to 1 percent slopes, clayey substratum, rarely flooded	42
41—Asher silty clay loam, saline, 0 to 1 percent slopes, occasionally flooded	43
42—Canadian fine sandy loam, 0 to 1 percent slopes, rarely flooded	44
49—Kirkland-Urban land-Pawhuska complex, 0 to 3 percent slopes	44
50—Kirkland silt loam, 0 to 1 percent slopes	46
51—Kirkland-Pawhuska complex, 0 to 3 percent slopes	46
52—Bethany-Pawhuska complex, 0 to 3 percent slopes	48
53—Kirkland-Pawhuska complex, 0 to 3 percent slopes, eroded	49
54—Slaughterville-Urban land complex, 1 to 5 percent slopes	50
55—Slaughterville-Urban land complex, 8 to 25 percent slopes	51
57—Teller-Urban land complex, 1 to 3 percent slopes	52
58—Teller-Urban land complex, 3 to 8 percent slopes	52
59—Bethany-Urban land complex, 0 to 3 percent slopes	53
60—Bethany silt loam, 0 to 1 percent slopes	54
61—Bethany silt loam, 1 to 3 percent slopes	55
62—Renfrow silt loam, 1 to 3 percent slopes	56
63—Renfrow silt loam, 3 to 5 percent slopes	56
64—Renfrow silty clay loam, 3 to 5 percent slopes, eroded	57
65—Renfrow-Huska complex, 3 to 5 percent slopes, eroded	58
66—Renfrow-Huska complex, 3 to 5 percent slopes	59
67—Newalla fine sandy loam, 3 to 5 percent slopes	60
68—Newalla sandy clay loam, 3 to 8 percent slopes, gullied	61
69—Renfrow-Urban land-Huska complex, 1 to 5 percent slopes	62
70—Slaughterville fine sandy loam, 1 to 3 percent slopes	63
71—Slaughterville fine sandy loam, 3 to 5 percent slopes	64
72—Slaughterville fine sandy loam, 5 to 8 percent slopes, loamy substratum	65
73—Slaughterville fine sandy loam, 8 to 25 percent slopes	66
74—Vanoss-Urban land-Norge complex, 0 to 3 percent slopes	66
75—Vanoss silt loam, 0 to 1 percent slopes	68
76—Vanoss silt loam, 1 to 3 percent slopes	68
77—Teller fine sandy loam, 1 to 3 percent slopes	69
78—Teller fine sandy loam, 3 to 5 percent slopes	70
79—Teller fine sandy loam, 5 to 8 percent slopes, eroded	71
80—Teller fine sandy loam, 5 to 8 percent slopes	71
81—Norge silt loam, 1 to 3 percent slopes	72
82—Norge silt loam, 3 to 5 percent slopes	73
83—Norge silt loam, 5 to 8 percent slopes, eroded	73
84—Grant-Huska complex, 1 to 5 percent slopes	74
85—Norge silt loam, 5 to 8 percent slopes	75
86—Norge-Urban land complex, 3 to 8 percent slopes	76

88—Grant-Urban land-Huska complex, 1 to 5 percent slopes	77
90—Keokuk very fine sandy loam, 0 to 1 percent slopes, rarely flooded	78
91—Gracemont silt loam, 0 to 1 percent slopes, occasionally flooded	79
92—Port fine sandy loam, 0 to 1 percent slopes, occasionally flooded	80
93—Port silt loam, 0 to 1 percent slopes, occasionally flooded	81
94—Port silt loam, 0 to 1 percent slopes, frequently flooded	81
95—Pulaski fine sandy loam, 0 to 1 percent slopes, occasionally flooded	82
96—Ashport silt loam, 0 to 1 percent slopes, occasionally flooded	83
97—Canadian fine sandy loam, 1 to 3 percent slopes, rarely flooded	83
98—Port-Urban land complex, 0 to 1 percent slopes, occasionally flooded	84
99—Urban land	85
AstA—Ashport silt loam, 0 to 1 percent slopes, frequently flooded	85
DAM—Large dam	86
M-W—Miscellaneous water	86
W—Water	87
Use and Management of the Soils	89
Rangeland	90
Similarity Index	92
Rangeland Management	93
Ecological Site Descriptions	94
Soil Properties	97
Physical Properties of Selected Soils	97
Chemical Properties of Selected Soils	97
<i>Table 5.—Physical Properties of Selected Soils</i>	99
<i>Table 6.—Chemical Properties of Selected Soils</i>	102
Formation and Classification of the Soils	105
Formation of the Soils	105
Climate	105
Living Organisms	105
Topography	106
Parent Material	106
Time	107
Classification of the Soils	107
<i>Table 7.—Classification of the Soils</i>	108
References	109
Glossary	111

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Foreword

This soil survey supplement contains information that can be used in conjunction with the previously published soil survey and with online resources. It provides valuable information for land-planning programs in Oklahoma. It contains predictions of soil behavior for selected land uses. This supplement also highlights limitations and hazards inherent in the soil, improvements needed to overcome the limitations, and the impact of selected land uses on the environment.

Soil surveys are designed for many different users. Farmers, ranchers, foresters, and agronomists can use a survey to evaluate the potential of the soil and the management needed for maximum food and fiber production. Planners, community officials, engineers, developers, builders, and home buyers can use a survey to plan land use, select sites for construction, and identify special practices needed to ensure proper performance. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use a survey to help them understand, protect, and enhance the environment.

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are shallow to bedrock. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited for use as septic tank absorption fields. A high water table makes a soil very limited for basements or underground installations.

These and many other soil properties that affect land use are described in soil surveys. Each soil in the survey area is described. Information on specific uses is given for each soil. Help in using this publication and additional information are available at the local office of the Natural Resources Conservation Service or the Cooperative Extension Service.



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Supplement to the Soil Survey of Cleveland County, Oklahoma

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(formerly the Soil Conservation Service)

United States Department of Agriculture,
Natural Resources Conservation Service,
in cooperation with
the Oklahoma Agricultural Experiment Station and
the Oklahoma Conservation Commission

This supplement provides information to update the original soil survey of Cleveland County, Oklahoma, which was issued April 1987 (USDA, 1987). The original tables and maps are not included in this document. Updated tables and new digital maps on updated photography are available from the Web Soil Survey at <http://websoilsurvey.nrcs.usda.gov>. The tables were generated from the NRCS National Soil Information System (NASIS) and are also available from the NRCS Soil Data Mart at <http://soildatamart.nrcs.usda.gov>.

CLEVELAND COUNTY is near the center of Oklahoma and is basically triangular in shape. It borders Oklahoma County to the north, Canadian County to the northwest, McClain County to the west and south, and Pottawatomie County to the east. The county has a total area of 356,467 acres, or 557 square miles. About 12,757 acres, or 3.6 percent of the county, is water areas larger than 40 surface acres.

In 2004, Cleveland County had a population of 222,074 and Norman, the county seat, had a population of 100,923. Currently, about 75 percent of the population lives within the incorporated city limits of Norman, Moore, Oklahoma City, Noble, Lexington, and Slaughterville.

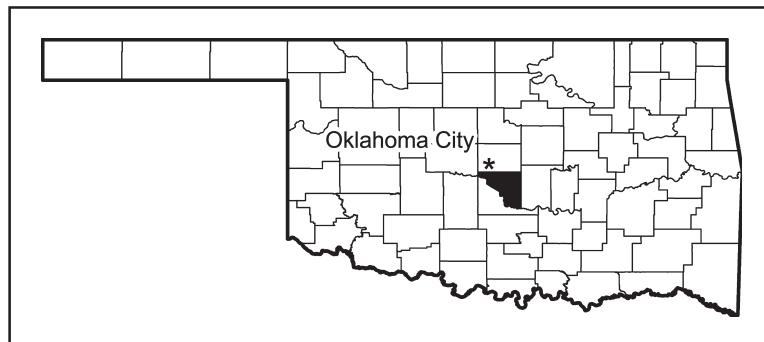


Figure 1.—Location of Cleveland County in Oklahoma.

About 32 percent of Cleveland County is open rangeland, 23 percent is woodland, 15 percent is tame pasture, 12 percent is cropland, 10 percent is urban land that is partly covered by urban structures, and 5 percent is water. About 57 percent of the county is prime farmland. The principal crops grown in 1980, in order of their harvested acreage, were winter wheat, alfalfa, grain sorghum, oats, soybeans, corn, forage sorghum, cotton, barley, and peanuts. Truck crops are grown on a limited acreage in parts of the county.

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in the survey area. The information includes a description of the soils and miscellaneous areas and their location and a discussion of their suitability, limitations, and management for specified uses. Soil scientists observe the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They dig many holes to study the soil profile, which is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

The soils and miscellaneous areas in a survey area are in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind or segment of the landscape. By observing the soils and miscellaneous areas in a survey area and relating their position to specific segments of the landscape, soil scientists develop a concept, or model, of how the soils were formed. Thus, during mapping, this model enables the soil scientists to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Individual soils on the landscape commonly merge into one another as their characteristics gradually change. To construct an accurate map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists record the characteristics of the soil profiles that they study. They note color, texture, size, and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in a survey area and determining their properties, the soil scientists assign the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classify and name the soils in a survey area, they compare the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected

Supplement to the Soil Survey of Cleveland County, Oklahoma

behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists locate and identify the significant natural bodies of soil in a survey area, they draw the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

The descriptions, names, and delineations of the soils in a survey area do not always fully agree with those of the soils in adjacent survey areas. Differences are the result of a better knowledge of soils, modifications in series concepts, or variations in the intensity of mapping or in the extent of the soils in the survey areas.

General Nature of the Survey Area

This section describes the settlement and development; physiography, relief, and drainage; natural resources; industry and transportation; and climate of Cleveland County.

Settlement and Development

Ruth Carroll, area clerk, Natural Resources Conservation Service, Oklahoma City, helped to prepare this section.

The part of Oklahoma that became Cleveland County was first settled by Indians. The Chickasaw Nation bordered on the south and west across the South Canadian River, and the Osage Indians claimed the area north of the river. In 1803, the area was acquired in the Louisiana Purchase by the United States. The Osage Indians controlled the area until 1825. The government then ceded it to the Creek Indians. In 1856, it was given to the Seminole Indians. In 1866, the Federal government acquired limited title through treaties with the Indians.

In 1870, the U.S. Government began surveying the area for subdivision into townships and sections. The project was completed in 1873. Settlers established a few cattle ranches in the area about 1870, but the area was officially opened for settlement in the Oklahoma Land Run of April 22, 1889.

The area remained as part of the Oklahoma Territory. It was originally named "Third County." Following the first election on August 25, 1890, the county was renamed Cleveland County in honor of former President Grover Cleveland (Cleveland County Historical Society, 1973). The University of Oklahoma in Norman was established in 1890, and construction was completed in 1893.

Most of the early settlers came from Kansas, Arkansas, Texas, Missouri, or Illinois. They lived mostly in one-room dugouts or in aboveground mud houses. Those fortunate enough to have scrub oak on their homesteads built log cabins

and heated them with remnants of wood chips, bark, and other timber removed to make way for planting their first crops. Early business buildings were constructed from lumber hauled in by railroad. These buildings were soon replaced with buildings made with bricks from brick companies established in Norman in 1891 and 1892. Corn, oats, cotton, wheat, and hay were the principal crops. Corn, oats, and hay were mostly used to feed horses and other livestock. Cotton and wheat were sold or were traded for essential items. Most settlers had small gardens. Potatoes, beans, corn, watermelons, strawberries, and orchard crops were grown for food.

Most early farmers plowed and planted crops without regard to the lay of the land. This method of farming resulted in rapid erosion, loss of fertility, and loss of much-needed moisture from the soil. As a result, many homesteaders were forced to sell or abandon their land during the 1930s. Much of the land lay idle and continued to erode for many years.

In the mid-1940s, farm commodity prices and climatic conditions began to improve. Urban dwellers began moving back to the country. Most landowners used new and improved farming methods and equipment to reclaim the land. Much of the eroded uplands in the eastern part of the county was sprigged to bermudagrass or seeded to lovegrass and used as tame pasture. Numerous farm ponds were constructed to water livestock and control erosion. Croplands were confined mostly to fertile soils along streams and to nearly level and very gently sloping soils on uplands. The acreage of cotton and corn fell rapidly. The acreage of small grains, grain sorghum, and alfalfa increased as mechanized farming replaced horse-drawn equipment. Farmers along the South Canadian River began drilling wells to irrigate alfalfa, corn, soybeans, and wheat.

More recently, urban dwellers moved back to the country, farm numbers rapidly increased, and farm size decreased. Much of the land was subdivided into 2.5-acre to 10-acre tracts, particularly in the eastern part of the county. People were attracted to the area by the woodlands, rolling hills, and reasonable land prices. Most of the landowners continued to work in nearby urban centers. They tended their land and livestock in the evenings and on weekends. Currently, Cleveland County has many farms that breed and train quarter horses and thoroughbred horses.

Physiography, Relief, and Drainage

Cleveland County is in the Osage Plains section of the Central Lowland physiographic province (Fenneman, 1930). The surface relief consists of an undulating to gently rolling, southeastward sloping plain. Most of the prairies in the western part of Cleveland County are nearly level to sloping and have broad, very shallow valleys. Small areas of strongly sloping to moderately steep breaks are along the South Canadian River and along small streams where the prairies give way to the forested uplands. These prairies are in the Central Rolling Red Prairies major land resource area. Forested lands in the eastern part of Cleveland County are in the Cross Timbers major land resource area. They are mostly very gently sloping to sloping uplands that have broad, fairly deep valleys dissected with numerous intermittent and permanent streams. Elevation ranges from about 1,370 feet in the northwestern part of the county to about 960 feet in the eastern part.

The South Canadian River flows southeasterly along the western and southern boundary of Cleveland County and drops about 9 feet per mile. The river and its short tributaries drain the western two-fifths of the county. The eastern part of the county is drained by the Little River, which heads in the town of Moore and flows southeastward into the South Canadian River. About 12 square miles in the northeast corner of the county drains into the North Canadian River.

Natural Resources

The soils are an important natural resource in Cleveland County. They provide a media for plants to grow and are used to produce crops for food, forage for livestock, and wood for fuel, shelter, and aesthetic purposes. Soils provide a base for building foundations, a source for topsoil used in landscaping, and a source of fill material for road construction and building sites. Some soils are used for their insulating qualities in construction of underground homes. Soil temperature data is becoming more important with the development of heating and cooling systems that extract air from ducts buried within the soil. Sand deposits beneath the Gracemore soils are suitable for use in concrete and mortar if washed and screened. Deposits of gravel and sand underlying map unit 10—Teval silt loam, 3 to 8 percent slopes, are suitable for surfacing secondary roads.

Water is another important natural resource. Most of the rainfall that runs off the surface is impounded in lakes or farm ponds and is used for municipal, industrial, or domestic purposes or by livestock. Lake Thunderbird in the east-central part of the county was constructed primarily as a municipal and industrial water supply for Norman, Del City, and Midwest City. Lake Stanley Draper in the northeastern part of the county is one of three lakes constructed as a water supply for Oklahoma City. The underground water supply in Cleveland County is very important. It comes from two main sources (Wood and Burton, 1968). Terrace deposits and alluvium along the South Canadian River supply adequate water for domestic and livestock use, and the Garber-Wellington Formation supplies an abundance of water for municipal, industrial, and domestic use. In places, the alluvial deposits along the South Canadian River supply water for sprinkler irrigation systems that are used primarily to increase production of alfalfa hay, soybeans, wheat, and corn for silage. Underground water wells mostly range in depth from 30 to 150 feet in the terrace and alluvial deposits and from about 300 to 900 feet in the Garber-Wellington Formation. The water is of very good quality for the most part, and recharge is expected to keep up with demand for many years.

Oil and gas are also important natural resources in the county. The first exploration well was drilled in 1919 (Johnson, 1958). It was drilled to a depth of 2,402 feet before being abandoned and declared a dry hole. Eleven years later, following the discovery of oil in Oklahoma County, the first producing oil well was completed in Cleveland County. Numerous wells have been drilled in the county since the mid-1930s with the greatest production and income coming from oil. Today, more than 20 separate oil and gas fields have been discovered in the county and the outlook is still favorable for a thriving industry.

The forested uplands in the eastern part of the county are a popular natural resource, primarily because of their aesthetic value as home sites. Numerous large tracts of land were subdivided into 2.5- to 10-acre tracts during the 1970s. The hilly, rolling topography and friable soils are suitable as sites for underground homes and log cabins and for using wood for fuel or wind generators to produce electricity.

Recreation is a major enterprise in the county, primarily because the soils, topography, and vegetation are well suited to this use. More than 17,000 surface acres of water is impounded in lakes, reservoirs, and farm ponds. The largest impoundments are Lake Thunderbird on the Little River east of Norman and Lake Stanley Draper on Elm Creek east of Moore. User fees are charged for some recreational activities. Little River State Park on the northwest shore of Lake Thunderbird has boating, fishing, camping, picnicking, swimming, playgrounds, and trails. Riding stables are also available. Lexington and Thunderbird public hunting areas are in the county. Openland wildlife and woodland wildlife are hunted during season. Quail and deer are concentrated in privately owned, forested uplands in the

eastern part of the county and along creeks and river bottoms elsewhere. Wild turkeys are abundant in some areas along wooded streams.

Industry and Transportation

Most of the industrial development in Cleveland County has taken place in the central part of the county near Norman and Moore. It includes manufacturers of oil and gas drilling products, manufacturers of heating and cooling equipment, a fence and iron company, and a crystal and salt company (Norman Chamber of Commerce, 1983). Most residents in the county commute to work in the metropolitan areas of Norman and Oklahoma City.

Cleveland County is served by a large network of Federal and State highways and local and county roads. Interstate Highway 35 crosses north-south through the center of the county, and Federal Highway 62, commonly referred to as the Southwest Expressway, crosses the northwest part of the county. Federal Highway 77 and State Highways 9, 37, and 39 lead to the two major expressways from the rural and suburban parts of the county. The Burlington Northern and Santa Fe railroad crosses north-south through the county. Small airports at Norman and Moore are maintained for small aircraft used for business and recreation.

Climate

Cleveland County is hot in summer but is cool in winter when surges of cold air occasionally cause a sharp drop in otherwise mild temperatures. Rainfall is uniformly distributed throughout the year, reaching a slight peak in spring. Snowfall is infrequent. Annual total precipitation is normally adequate for cotton, feed grains, and small grains.

The table "Temperature and Precipitation" gives data for the survey area as recorded at Norman, Oklahoma, in the period 1951 to 1977. The table "Freeze Dates in Spring and Fall" shows probable dates of the first freeze in fall and the last freeze in spring. The table "Growing Season" provides data on the length of the growing season.

In winter, the average temperature is 40 degrees F and the average daily minimum temperature is 28 degrees. The lowest temperature on record, which occurred at Norman on January 5, 1959, is -4 degrees. In summer, the average temperature is 80 degrees and the average daily maximum temperature is 92 degrees. The highest recorded temperature, which occurred at Norman on August 6, 1956, is 109 degrees.

Growing degree days are shown in the table "Temperature and Precipitation." They are equivalent to "heat units." During the month, growing degree days accumulate by the amount that the average temperature each day exceeds a base temperature (50 degrees F). The normal monthly accumulation is used to schedule single or successive plantings of a crop between the last freeze in spring and the first freeze in fall.

The average annual total precipitation is about 33.14 inches. Of this, about 22 inches, or 66 percent, usually falls in April through September. The growing season for most crops falls within this period. In 2 years out of 10, the rainfall in April through September is less than 17 inches. The heaviest 1-day rainfall during the period of record was 4.87 inches at Norman on May 23, 1975. Thunderstorms occur on about 50 days each year. Most occur in summer.

The average seasonal snowfall is 7.4 inches. The greatest snow depth at any one time during the period of record was 8 inches. On an average, 3 days per year have at least 1 inch of snow on the ground. The number of such days varies greatly from year to year.

Supplement to the Soil Survey of Cleveland County, Oklahoma

The average relative humidity in mid-afternoon is about 52 percent. Humidity is higher at night, and the average at dawn is about 80 percent. The sun shines 75 percent of the time possible in summer and 60 percent in winter. The prevailing wind is from the southwest. Average wind speed is highest, 15 miles per hour, in spring.

Tornadoes and severe thunder storms occur occasionally. These storms are local and are short in duration; the pattern of damage is variable and spotty.

Table 1.--Temperature and Precipitation

[Recorded in the period 1951-1977 at Norman, Oklahoma]

Month	Temperature						Precipitation				
				2 years in 10 will have--		Average number of growing degree days*	Avg.	2 years in 10 will have--		Average number of days with 0.10 inch	Average snowfall
	Average daily maximum	Average daily minimum	Average	Max. temp. higher than	Min. temp. lower than			Less than--	More than--		
	°F	°F	°F	°F	°F	Units	In	In	In		In
January---	48.5	25.5	37.1	73	0	11	0.96	0.24	1.53	2	2.0
February---	54.3	29.8	42.1	80	8	27	1.26	0.53	1.84	4	1.9
March-----	62.0	37.0	49.6	89	13	157	2.19	0.91	3.21	4	1.4
April-----	72.9	48.8	60.9	93	26	336	3.30	1.68	4.44	5	0.1
May-----	80.1	57.7	68.9	95	39	586	5.53	2.88	7.52	7	0.0
June-----	88.5	66.1	77.3	100	51	819	3.61	1.43	5.37	6	0.0
July-----	94.0	70.1	82.0	106	56	992	2.95	1.00	4.45	5	0.0
August----	93.5	68.8	81.2	105	56	968	2.55	1.09	3.71	5	0.0
September--	85.5	61.3	73.4	101	42	702	4.23	1.19	6.28	5	0.0
October---	75.0	50.0	62.5	93	30	391	3.32	1.05	4.97	4	0.0
November---	61.1	37.1	49.1	82	17	99	1.86	0.39	5.87	3	0.4
December--	51.6	29.0	40.3	75	4	14	1.38	0.48	2.01	3	1.6
Yearly:											
Average--	72.3	48.4	60.4	---	---	---	---	---	---	---	---
Extreme--	---	---	---	107	0	---	---	---	---	---	---
Total----	---	---	---	---	---	5,102	33.14	25.36	39.18	53	7.4

* A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (50 degrees F).

Supplement to the Soil Survey of Cleveland County, Oklahoma

Table 2.--Freeze Dates in Spring and Fall

[Recorded in the period 1951-1977 at Norman, Oklahoma]

Probability	Temperature		
	24 °F or lower	28 °F or lower	32 °F or lower
Last freezing temperature in spring:			
1 year in 10 later than--	Apr. 1	Apr. 12	Apr. 19
2 years in 10 later than--	Mar. 26	Apr. 8	Apr. 14
5 years in 10 later than--	Mar. 15	Mar. 28	Apr. 5
First freezing temperature in fall:			
1 year in 10 earlier than--	Oct. 28	Oct. 26	Oct. 17
2 years in 10 earlier than--	Nov. 5	Nov. 1	Oct. 23
5 years in 10 earlier than--	Nov. 20	Nov. 11	Nov. 2

Table 3.--Growing Season

[Recorded in the period 1951-1977 at Norman, Oklahoma]

Probability	Daily Minimum Temperature During growing season		
	Higher than 24 °F	Higher than 28 °F	Higher than 32 °F
	Days	Days	Days
9 years in 10	219	205	187
8 years in 10	229	212	194
5 years in 10	250	227	209
2 years in 10	270	241	224
1 year in 10	281	249	232

Detailed Soil Map Units

Detailed soil maps for the survey area are available online at <http://websoilsurvey.nrcs.usda.gov>. The map units on the detailed soil maps represent the soils and miscellaneous areas in the survey area. The map unit descriptions in this section, along with the maps, can be used to determine the suitability and potential of a unit for specific uses. They also can be used to plan the management needed for those uses.

A map unit delineation on the detailed soil maps represents an area on the landscape and consists of one or more soils or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils or miscellaneous areas. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils and miscellaneous areas are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, are mapped without areas of minor components of other taxonomic classes. Consequently, map units are made up of the soils or miscellaneous areas for which they are named and some areas of included soils that belong to other taxonomic classes.

Most included soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting or similar inclusions. They may or may not be mentioned in the map unit description. Other included soils and miscellaneous areas, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, inclusions. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. The included areas of contrasting soils or miscellaneous areas are mentioned in the map unit descriptions. A few included areas may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of included areas in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into segments that have similar use and management requirements. The delineation of such landscape segments on the map provides sufficient information for the development of resource plans, but if intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit.

Soils that have profiles that are almost alike make up a soil series. Except for differences in texture of the surface layer or of the underlying layers, all the soils of

a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer or of the underlying layers. They also can differ in slope, stoniness, salinity, wetness, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into soil phases. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Ashport silt loam, 0 to 1 percent slopes, occasionally flooded, is a phase of the Ashport series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Stephenville-Darsil-Newalla complex, 3 to 8 percent slopes, is an example.

This survey includes *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Urban land is an example.

The table "Acreage and Proportionate Extent of the Soils" gives the acreage and proportionate extent of each map unit. The Glossary defines many of the terms used in describing the soils or miscellaneous areas.

Supplement to the Soil Survey of Cleveland County, Oklahoma

Table 4.--Acreage and Proportionate Extent of the Soils

Map symbol	Soil name	Acres	Percent
1	Stephenville-Darsil-Newalla complex, 3 to 8 percent slopes-----	61,125	17.1
2	Harrah fine sandy loam, 5 to 8 percent slopes-----	28,885	8.1
3	Grainola-Ashport complex, 0 to 8 percent slopes-----	6,873	1.9
4	Gracemore-Gaddy complex, 0 to 1 percent slopes, occasionally flooded-----	2,129	0.6
5	Harrah fine sandy loam, 5 to 8 percent slopes, gullied-----	8,503	2.4
6	Grainola-Ironmound complex, 5 to 12 percent slopes-----	5,240	1.5
7	Stephenville-Darsil complex, 1 to 5 percent slopes-----	13,770	3.9
8	Stephenville-Darsil-Newalla complex, 3 to 8 percent slopes, gullied-----	9,746	2.7
9	Kingfisher-Ironmound complex, 1 to 5 percent slopes-----	7,075	2.0
10	Teval silt loam, 3 to 8 percent slopes-----	794	0.2
11	Dougherty-Konawa complex, 3 to 8 percent slopes-----	779	0.2
12	Derby loamy fine sand, 0 to 3 percent slopes-----	781	0.2
13	Derby loamy fine sand, 3 to 15 percent slopes-----	1,524	0.4
14	Derby-Urban land complex, 3 to 15 percent slopes-----	134	*
15	Littleaxe loamy fine sand, 1 to 3 percent slopes-----	4,862	1.4
17	Gracemore silty clay loam, saline, 0 to 1 percent slopes, frequently flooded-----	1,364	0.4
18	Gracemore loamy fine sand, 0 to 1 percent slopes, frequently flooded-----	4,383	1.2
19	Goodnight loamy fine sand, 5 to 20 percent slopes-----	912	0.3
20	Tribbey fine sandy loam, 0 to 1 percent slopes, frequently flooded-----	7,684	2.2
21	Pits-----	830	0.2
28	Kingfisher-Urban land-Ironmound complex, 1 to 5 percent slopes-----	139	*
29	Ironmound very fine sandy loam, 5 to 8 percent slopes-----	599	0.2
30	Brewless silty clay loam, 0 to 1 percent slopes, rarely flooded-----	2,779	0.8
32	Lomill silty clay, 0 to 1 percent slopes, occasionally flooded-----	3,269	0.9
33	Norge-Ashport complex, 0 to 8 percent slopes-----	4,763	1.3
34	Brewless-Urban land complex, 0 to 1 percent slopes, rarely flooded-----	119	*
35	Stephenville-Darsil-Newalla complex, 3 to 8 percent slopes, eroded-----	11,894	3.3
36	Stephenville-Darsil complex, 1 to 5 percent slopes, eroded-----	3,013	0.8
37	Harrah fine sandy loam, 5 to 8 percent slopes, eroded-----	12,971	3.6
38	Asher-Urban land complex, 0 to 1 percent slopes, rarely flooded-----	146	*
39	Asher silt loam, 0 to 1 percent slopes, clayey substratum, rarely flooded-----	1,632	0.5
40	Asher silty clay loam, 0 to 1 percent slopes, clayey substratum, rarely flooded-----	1,653	0.5
41	Asher silty clay loam, saline, 0 to 1 percent slopes, occasionally flooded-----	556	0.2
42	Canadian fine sandy loam, 0 to 1 percent slopes, rarely flooded-----	763	0.2
49	Kirkland-Urban land-Pawhuska complex, 0 to 3 percent slopes-----	5,547	1.6
50	Kirkland silt loam, 0 to 1 percent slopes-----	6,090	1.7
51	Kirkland-Pawhuska complex, 0 to 3 percent slopes-----	4,579	1.3
52	Bethany-Pawhuska complex, 0 to 3 percent slopes-----	921	0.3
53	Kirkland-Pawhuska complex, 0 to 3 percent slopes, eroded-----	4,113	1.2
54	Slaughterville-Urban land complex, 1 to 5 percent slopes-----	553	0.2
55	Slaughterville-Urban land complex, 8 to 25 percent slopes-----	23	*
57	Teller-Urban land complex, 1 to 3 percent slopes-----	1,012	0.3
58	Teller-Urban land complex, 3 to 8 percent slopes-----	435	0.1
59	Bethany-Urban land complex, 0 to 3 percent slopes-----	754	0.2
60	Bethany silt loam, 0 to 1 percent slopes-----	2,987	0.8
61	Bethany silt loam, 1 to 3 percent slopes-----	1,615	0.5
62	Renfrow silt loam, 1 to 3 percent slopes-----	2,002	0.6
63	Renfrow silt loam, 3 to 5 percent slopes-----	1,323	0.4
64	Renfrow silty clay loam, 3 to 5 percent slopes, eroded-----	4,144	1.2
65	Renfrow-Huska complex, 3 to 5 percent slopes, eroded-----	10,981	3.1
66	Renfrow-Huska complex, 3 to 5 percent slopes-----	4,841	1.4
67	Newalla fine sandy loam, 3 to 5 percent slopes-----	2,847	0.8
68	Newalla sandy clay loam, 3 to 8 percent slopes, gullied-----	989	0.3
69	Renfrow-Urban land-Huska complex, 1 to 5 percent slopes-----	2,007	0.6
70	Slaughterville fine sandy loam, 1 to 3 percent slopes-----	1,807	0.5
71	Slaughterville fine sandy loam, 3 to 5 percent slopes-----	1,909	0.5
72	Slaughterville fine sandy loam, 5 to 8 percent slopes, loamy substratum-----	853	0.2
73	Slaughterville fine sandy loam, 8 to 25 percent slopes-----	607	0.2

* See footnote at end of table.

Supplement to the Soil Survey of Cleveland County, Oklahoma

Table 4.--Acreage and Proportionate Extent of the Soils--Continued

Map symbol	Soil name	Acres	Percent
74	Vanoss-Urban land-Norge complex, 0 to 3 percent slopes-----	1,295	0.4
75	Vanoss silt loam, 0 to 1 percent slopes-----	3,633	1.0
76	Vanoss silt loam, 1 to 3 percent slopes-----	3,462	1.0
77	Teller fine sandy loam, 1 to 3 percent slopes-----	5,036	1.4
78	Teller fine sandy loam, 3 to 5 percent slopes-----	3,479	1.0
79	Teller fine sandy loam, 5 to 8 percent slopes, eroded-----	3,112	0.9
80	Teller fine sandy loam, 5 to 8 percent slopes-----	975	0.3
81	Norge silt loam, 1 to 3 percent slopes-----	3,078	0.9
82	Norge silt loam, 3 to 5 percent slopes-----	4,225	1.2
83	Norge silt loam, 5 to 8 percent slopes, eroded-----	2,992	0.8
84	Grant-Huska complex, 1 to 5 percent slopes-----	5,739	1.6
85	Norge silt loam, 5 to 8 percent slopes-----	623	0.2
86	Norge-Urban land complex, 3 to 8 percent slopes-----	310	*
88	Grant-Urban land-Huska complex, 1 to 5 percent slopes-----	317	*
90	Keokuk very fine sandy loam, 0 to 1 percent slopes, rarely flooded-----	2,592	0.7
91	Gracemont silt loam, 0 to 1 percent slopes, occasionally flooded-----	1,549	0.4
92	Port fine sandy loam, 0 to 1 percent slopes, occasionally flooded-----	3,045	0.9
93	Port silt loam, 0 to 1 percent slopes, occasionally flooded-----	3,483	1.0
94	Port silt loam, 0 to 1 percent slopes, frequently flooded-----	5,401	1.5
95	Pulaski fine sandy loam, 0 to 1 percent slopes, occasionally flooded-----	7,159	2.0
96	Ashport silt loam, 0 to 1 percent slopes, occasionally flooded-----	5,541	1.6
97	Canadian fine sandy loam, 1 to 3 percent slopes, rarely flooded-----	651	0.2
98	Port-Urban land complex, 0 to 1 percent slopes, occasionally flooded-----	82	*
99	Urban land-----	975	0.3
AstA	Ashport silt loam, 0 to 1 percent slopes, frequently flooded-----	81	*
DAM	Large dam-----	103	*
M-W	Miscellaneous water-----	144	*
W	Water-----	12,757	3.6
	Total-----	356,467	100.0

* Less than 0.1 percent.

1—Stephenville-Darsil-Newalla complex, 3 to 8 percent slopes

Map Unit Setting

Major land resource area: 84A

Elevation: 700 to 1,500 feet

Mean annual precipitation: 26 to 40 inches

Mean annual air temperature: 57 to 64 degrees F

Frost-free period: 200 to 240 days

Major Component Description

Stephenville

Extent: 55 percent of the map unit

Geomorphic setting: Hillslopes on hills on uplands

Position on hillslope: Backslopes and shoulders

Parent material: Loamy residuum weathered from sandstone

Slope: 3 to 8 percent

Surface runoff class: Medium

Soil depth: 20 to 40 inches to bedrock (paralithic)

Slowest permeability class of the soil to a depth of 60 inches or above a restrictive layer: Moderate

Slowest permeability class within a depth of 80 inches: Moderately slow

Drainage class: Well drained

Available water capacity: About 4.3 inches

Depth to the top of the seasonal high water table: Greater than 6 feet

Flooding: None

Ponding: None

Land capability classification, nonirrigated: 4e

Ecological site number and name: R084AY075OK, Sandy Savannah PE 44-64

Typical profile:

A—0 to 4 inches; fine sandy loam

E—4 to 10 inches; loamy fine sand

Bt—10 to 28 inches; sandy clay loam

Cr—28 to 36 inches; bedrock

Darsil

Extent: 15 percent of the map unit

Geomorphic setting: Hillslopes on hills on uplands

Position on hillslope: Backslopes

Parent material: Sandy residuum weathered from sandstone

Slope: 3 to 8 percent

Surface runoff class: High

Soil depth: 10 to 20 inches to bedrock (paralithic)

Slowest permeability class of the soil to a depth of 60 inches or above a restrictive layer: Rapid

Slowest permeability class within a depth of 80 inches: Moderately slow

Drainage class: Excessively drained

Available water capacity: About 1.4 inches

Depth to the top of the seasonal high water table: Greater than 6 feet

Flooding: None

Ponding: None

Land capability classification, nonirrigated: 6e

Ecological site number and name: R084AY089OK, Shallow Savannah PE 48-64

Typical profile:

A—0 to 5 inches; loamy fine sand
EC—5 to 17 inches; fine sand
Cr—17 to 23 inches; bedrock

Newalla

Extent: 15 percent of the map unit

Geomorphic setting: Hillslopes on hills on uplands

Position on hillslope: Backslopes

Parent material: Loamy residuum weathered from sandstone over clayey residuum weathered from shale

Slope: 3 to 8 percent

Surface runoff class: Very high

Soil depth: 40 to 60 inches to bedrock (paralithic)

Slowest permeability class of the soil to a depth of 60 inches or above a restrictive layer: Very slow

Slowest permeability class within a depth of 80 inches: Very slow

Drainage class: Moderately well drained

Available water capacity: About 8.6 inches

Depth to the top of the seasonal high water table: Greater than 6 feet

Flooding: None

Ponding: None

Land capability classification, nonirrigated: 4e

Ecological site number and name: R084AY075OK, Sandy Savannah PE

44-64

Typical profile:

A—0 to 3 inches; fine sandy loam
E—3 to 6 inches; fine sandy loam
Bt1—6 to 10 inches; sandy clay loam
2Bt2—10 to 51 inches; clay
2Bt3—51 to 58 inches; gravelly clay
2Cr—58 to 80 inches; bedrock

Additional Components

Harrah soils: 5 percent of the map unit

Grainola soils: 3 percent of the map unit

Littleaxe soils: 3 percent of the map unit

Derby soils: 2 percent of the map unit

Pulaski soils: 2 percent of the map unit

2—Harrah fine sandy loam, 5 to 8 percent slopes

Map Unit Setting

Major land resource area: 84A

Elevation: 700 to 1,500 feet

Mean annual precipitation: 26 to 40 inches

Mean annual air temperature: 57 to 64 degrees F

Frost-free period: 200 to 240 days

Major Component Description

Harrah

Extent: 80 percent of the map unit

Geomorphic setting: Hillslopes on hills on uplands

Position on hillslope: Backslopes and footslopes

Position on landform: Side slopes

Parent material: Loamy and sandy colluvium derived from sandstone

Slope: 5 to 8 percent

Surface runoff class: Medium

Soil depth: Greater than 60 inches

Slowest permeability class of the soil to a depth of 60 inches or above a restrictive layer: Moderate

Slowest permeability class within a depth of 80 inches: Moderate

Drainage class: Well drained

Available water capacity: About 8.0 inches

Depth to the top of the seasonal high water table: Greater than 6 feet

Flooding: None

Ponding: None

Land capability classification, nonirrigated: 4e

Ecological site number and name: R084AY075OK, Sandy Savannah PE 44-64

Typical profile:

A—0 to 6 inches; fine sandy loam

E—6 to 14 inches; loamy fine sand

Bt1—14 to 51 inches; sandy clay loam

Bt2—51 to 80 inches; sandy clay loam

Additional Components

Stephenville soils: 9 percent of the map unit

Lomill soils: 3 percent of the map unit

Pulaski soils: 3 percent of the map unit

Tribbey soils: 3 percent of the map unit

Keokuk soils: 2 percent of the map unit

3—Grainola-Ashport complex, 0 to 8 percent slopes

Map Unit Setting

Major land resource area: 80A

Elevation: 700 to 1,500 feet

Mean annual precipitation: 26 to 40 inches

Mean annual air temperature: 57 to 65 degrees F

Frost-free period: 185 to 240 days

Major Component Description

Grainola

Extent: 55 percent of the map unit

Geomorphic setting: Hillslopes on hills on uplands

Position on hillslope: Backslopes

Position on landform: Side slopes

Parent material: Calcareous, clayey residuum weathered from shale

Slope: 3 to 8 percent

Surface runoff class: Very high

Soil depth: 20 to 40 inches to bedrock (paralithic)

Slowest permeability class of the soil to a depth of 60 inches or above a restrictive layer: Slow

Slowest permeability class within a depth of 80 inches: Impermeable

Drainage class: Well drained

Available water capacity: About 4.4 inches

Depth to the top of the seasonal high water table: Greater than 6 feet

Flooding: None

Ponding: None

Land capability classification, nonirrigated: 4e

Ecological site number and name: R080AY010OK, Claypan Prairie (North) PE 44-64

Typical profile:

A—0 to 3 inches; silty clay loam

Bt1—3 to 8 inches; silty clay

Bt2—8 to 27 inches; gravelly silty clay

Cr—27 to 30 inches; bedrock

Ashport

Extent: 15 percent of the map unit

Geomorphic setting: Flood plains in river valleys

Parent material: Fine-silty alluvium

Slope: 0 to 3 percent

Surface runoff class: Low

Soil depth: Greater than 60 inches

Slowest permeability class of the soil to a depth of 60 inches or above a restrictive layer: Moderate

Slowest permeability class within a depth of 80 inches: Moderate

Drainage class: Well drained

Available water capacity: About 11.8 inches

Depth to the top of the seasonal high water table: Greater than 6 feet

Flooding: Frequent

Ponding: None

Land capability classification, nonirrigated: 5w

Ecological site number and name: R080AY050OK, Loamy Bottomland PE 44-64

Typical profile:

A—0 to 6 inches; silt loam

Bw—6 to 16 inches; silt loam

Ck—16 to 60 inches; stratified silt loam to silty clay loam

Additional Components

Ironmound soils: 8 percent of the map unit

Norge soils: 8 percent of the map unit

Port soils: 5 percent of the map unit

Pulaski soils: 5 percent of the map unit

Huska soils: 2 percent of the map unit

Renfrow soils: 2 percent of the map unit

4—Gracemore-Gaddy complex, 0 to 1 percent slopes, occasionally flooded

Map Unit Setting

Major land resource area: 80A

Elevation: 700 to 2,200 feet

Mean annual precipitation: 22 to 38 inches

Mean annual air temperature: 57 to 64 degrees F

Frost-free period: 185 to 230 days

Major Component Description

Gracemore

Extent: 65 percent of the map unit

Geomorphic setting: Flood plains in river valleys

Supplement to the Soil Survey of Cleveland County, Oklahoma

Parent material: Calcareous, sandy alluvium

Slope: 0 to 1 percent

Surface runoff class: High

Soil depth: Greater than 60 inches

Slowest permeability class of the soil to a depth of 60 inches or above a restrictive layer: Moderately rapid

Slowest permeability class within a depth of 80 inches: Moderately rapid

Drainage class: Somewhat poorly drained

Available water capacity: About 5.4 inches

Depth to the top of the seasonal high water table: 0.5 to 1.5 feet

Flooding: Occasional

Ponding: None

Land capability classification, nonirrigated: 4w

Ecological site number and name: R080AY095OK, Subirrigated PE 44-64

Typical profile:

A—0 to 6 inches; silty clay loam

C—6 to 72 inches; fine sand

Gaddy

Extent: 25 percent of the map unit

Geomorphic setting: Flood plains in river valleys

Parent material: Calcareous, sandy alluvium

Slope: 0 to 1 percent

Surface runoff class: Negligible

Soil depth: Greater than 60 inches

Slowest permeability class of the soil to a depth of 60 inches or above a restrictive layer: Rapid

Slowest permeability class within a depth of 80 inches: Rapid

Drainage class: Somewhat excessively drained

Available water capacity: About 4.8 inches

Depth to the top of the seasonal high water table: Greater than 6 feet

Flooding: Occasional

Ponding: None

Land capability classification, nonirrigated: 3e

Ecological site number and name: R080AY068OK, Sandy Bottomland PE 44-64

Typical profile:

A—0 to 9 inches; loamy fine sand

C—9 to 72 inches; stratified fine sand to clay loam

Additional Components

Ezell soils: 10 percent of the map unit

5—Harrah fine sandy loam, 5 to 8 percent slopes, gullied

Map Unit Setting

Major land resource area: 84A

Elevation: 750 to 1,500 feet

Mean annual precipitation: 30 to 40 inches

Mean annual air temperature: 57 to 63 degrees F

Frost-free period: 200 to 230 days

Major Component Description

Harrah

Extent: 75 percent of the map unit

Geomorphic setting: Hillslopes on hills on uplands

Position on hillslope: Backslopes

Parent material: Loamy and sandy colluvium derived from sandstone

Slope: 5 to 8 percent

Surface runoff class: Medium

Soil depth: Greater than 60 inches

Slowest permeability class of the soil to a depth of 60 inches or above a restrictive layer: Moderate

Slowest permeability class within a depth of 80 inches: Moderate

Drainage class: Well drained

Available water capacity: About 7.9 inches

Depth to the top of the seasonal high water table: Greater than 6 feet

Flooding: None

Ponding: None

Land capability classification, nonirrigated: 6e

Ecological site number and name: R084AY876OK, Eroded Sandy Savannah PE
48-64

Typical profile:

A—0 to 9 inches; fine sandy loam

E—9 to 19 inches; loamy fine sand

Bt1—19 to 52 inches; sandy clay loam

Bt2—52 to 86 inches; sandy clay loam

Additional Components

Littleaxe soils: 10 percent of the map unit

Newalla soils: 10 percent of the map unit

Stephenville soils: 5 percent of the map unit

6—Grainola-Ironmound complex, 5 to 12 percent slopes

Map Unit Setting

Major land resource area: 80A

Elevation: 700 to 1,500 feet

Mean annual precipitation: 26 to 40 inches

Mean annual air temperature: 57 to 65 degrees F

Frost-free period: 190 to 230 days

Major Component Description

Grainola

Extent: 65 percent of the map unit

Geomorphic setting: Hillslopes on hills on uplands

Position on hillslope: Backslopes

Position on landform: Side slopes

Parent material: Calcareous, clayey residuum weathered from shale

Slope: 5 to 12 percent

Surface runoff class: Very high

Soil depth: 20 to 40 inches to bedrock (paralithic)

Slowest permeability class of the soil to a depth of 60 inches or above a restrictive layer: Slow

Slowest permeability class within a depth of 80 inches: Impermeable

Drainage class: Well drained

Available water capacity: About 5.3 inches

Depth to the top of the seasonal high water table: Greater than 6 feet

Flooding: None

Ponding: None

Land capability classification, nonirrigated: 6e

Ecological site number and name: R080AY010OK, Claypan Prairie (North) PE 44-64

Typical profile:

A—0 to 4 inches; gravelly silty clay loam

Bt—4 to 30 inches; silty clay

BC—30 to 38 inches; channery silty clay

Cr—38 to 45 inches; bedrock

Ironmound

Extent: 15 percent of the map unit

Geomorphic setting: Hillslopes on hills on uplands

Position on hillslope: Backslopes and shoulders

Position on landform: Side slopes

Parent material: Loamy residuum weathered from sandstone and shale

Slope: 5 to 12 percent

Surface runoff class: Very high

Soil depth: 10 to 20 inches to bedrock (paralithic)

Slowest permeability class of the soil to a depth of 60 inches or above a restrictive layer: Moderate

Slowest permeability class within a depth of 80 inches: Impermeable

Drainage class: Well drained

Available water capacity: About 2.0 inches

Depth to the top of the seasonal high water table: Greater than 6 feet

Flooding: None

Ponding: None

Land capability classification, nonirrigated: 6e

Ecological site number and name: R080AY083OK, Shallow Prairie PE 44-64

Typical profile:

A—0 to 4 inches; very fine sandy loam

Bw—4 to 12 inches; very fine sandy loam

Cr—12 to 30 inches; bedrock

Additional Components

Kingfisher soils: 8 percent of the map unit

Renfrow soils: 7 percent of the map unit

Norge soils: 3 percent of the map unit

Ashport soils: 2 percent of the map unit

7—Stephenville-Darsil complex, 1 to 5 percent slopes

Map Unit Setting

Major land resource area: 84A

Elevation: 750 to 1,500 feet

Mean annual precipitation: 30 to 40 inches

Mean annual air temperature: 57 to 63 degrees F

Frost-free period: 200 to 230 days

Major Component Description

Stephenville

Extent: 75 percent of the map unit

Geomorphic setting: Hillslopes on hills on uplands

Position on hillslope: Shoulders

Parent material: Loamy residuum weathered from sandstone

Slope: 3 to 5 percent

Supplement to the Soil Survey of Cleveland County, Oklahoma

Surface runoff class: Low

Soil depth: 20 to 40 inches to bedrock (paralithic)

Slowest permeability class of the soil to a depth of 60 inches or above a restrictive layer: Moderate

Slowest permeability class within a depth of 80 inches: Moderately slow

Drainage class: Well drained

Available water capacity: About 4.5 inches

Depth to the top of the seasonal high water table: Greater than 6 feet

Flooding: None

Ponding: None

Land capability classification, nonirrigated: 3e

Ecological site number and name: R084AY075OK, Sandy Savannah PE 44-64

Typical profile:

A—0 to 5 inches; fine sandy loam

E—5 to 9 inches; fine sandy loam

Bt1—9 to 20 inches; sandy clay loam

Bt2—20 to 29 inches; fine sandy loam

Cr—29 to 34 inches; bedrock

Darsil

Extent: 15 percent of the map unit

Geomorphic setting: Hillslopes on hills on uplands

Position on hillslope: Backslopes

Parent material: Sandy residuum weathered from sandstone

Slope: 1 to 5 percent

Surface runoff class: Medium

Soil depth: 10 to 20 inches to bedrock (paralithic)

Slowest permeability class of the soil to a depth of 60 inches or above a restrictive layer: Rapid

Slowest permeability class within a depth of 80 inches: Moderately slow

Drainage class: Excessively drained

Available water capacity: About 1.2 inches

Depth to the top of the seasonal high water table: Greater than 6 feet

Flooding: None

Ponding: None

Land capability classification, nonirrigated: 4s

Ecological site number and name: R084AY089OK, Shallow Savannah PE 48-64

Typical profile:

A—0 to 4 inches; loamy fine sand

EC—4 to 14 inches; loamy fine sand

Cr—14 to 20 inches; bedrock

Additional Components

Littleaxe soils: 5 percent of the map unit

Newalla soils: 5 percent of the map unit

8—Stephenville-Darsil-Newalla complex, 3 to 8 percent slopes, gullied

Map Unit Setting

Major land resource area: 84A

Elevation: 750 to 1,500 feet

Mean annual precipitation: 26 to 40 inches

Supplement to the Soil Survey of Cleveland County, Oklahoma

Mean annual air temperature: 57 to 64 degrees F

Frost-free period: 200 to 230 days

Major Component Description

Stephenville

Extent: 55 percent of the map unit

Geomorphic setting: Hillslopes on hills on uplands

Position on hillslope: Backslopes

Parent material: Loamy residuum weathered from sandstone

Slope: 3 to 8 percent

Surface runoff class: Medium

Soil depth: 20 to 40 inches to bedrock (paralithic)

Slowest permeability class of the soil to a depth of 60 inches or above a restrictive layer: Moderate

Slowest permeability class within a depth of 80 inches: Moderately slow

Drainage class: Well drained

Available water capacity: About 4.2 inches

Depth to the top of the seasonal high water table: Greater than 6 feet

Flooding: None

Ponding: None

Land capability classification, nonirrigated: 6e

Ecological site number and name: R084AY876OK, Eroded Sandy Savannah PE 48-64

Typical profile:

A—0 to 3 inches; fine sandy loam

E—3 to 8 inches; fine sandy loam

Bt—8 to 26 inches; sandy clay loam

Cr—26 to 30 inches; bedrock

Darsil

Extent: 15 percent of the map unit

Geomorphic setting: Hillslopes on hills on uplands

Position on hillslope: Backslopes

Parent material: Sandy residuum weathered from sandstone

Slope: 3 to 8 percent

Surface runoff class: Medium

Soil depth: 10 to 20 inches to bedrock (paralithic)

Slowest permeability class of the soil to a depth of 60 inches or above a restrictive layer: Rapid

Slowest permeability class within a depth of 80 inches: Moderately slow

Drainage class: Excessively drained

Available water capacity: About 1.7 inches

Depth to the top of the seasonal high water table: Greater than 6 feet

Flooding: None

Ponding: None

Land capability classification, nonirrigated: 6e

Ecological site number and name: R084AY889OK, Eroded Shallow Savannah PE 48-64

Typical profile:

A—0 to 7 inches; loamy fine sand

EC—7 to 20 inches; loamy fine sand

Cr—20 to 26 inches; bedrock

Newalla

Extent: 15 percent of the map unit

Geomorphic setting: Hillslopes on hills on uplands

Position on hillslope: Backslopes

Parent material: Loamy residuum weathered from sandstone over clayey residuum weathered from shale

Slope: 3 to 8 percent

Surface runoff class: Very high

Soil depth: 40 to 60 inches to bedrock (paralithic)

Slowest permeability class of the soil to a depth of 60 inches or above a restrictive layer: Very slow

Slowest permeability class within a depth of 80 inches: Very slow

Drainage class: Moderately well drained

Available water capacity: About 6.9 inches

Depth to the top of the seasonal high water table: Greater than 6 feet

Flooding: None

Ponding: None

Land capability classification, nonirrigated: 6e

Ecological site number and name: R084AY876OK, Eroded Sandy Savannah PE
48-64

Typical profile:

A—0 to 3 inches; fine sandy loam

Bt1—3 to 9 inches; sandy clay loam

2Bt2—9 to 42 inches; silty clay

2Bt3—42 to 46 inches; silty clay

2Cr—46 to 54 inches; bedrock

Additional Components

Harrah soils: 7 percent of the map unit

Littleaxe soils: 6 percent of the map unit

Grainola soils: 2 percent of the map unit

9—Kingfisher-Ironmound complex, 1 to 5 percent slopes

Map Unit Setting

Major land resource area: 80A

Elevation: 700 to 1,500 feet

Mean annual precipitation: 26 to 40 inches

Mean annual air temperature: 57 to 64 degrees F

Frost-free period: 190 to 230 days

Major Component Description

Kingfisher

Extent: 60 percent of the map unit

Geomorphic setting: Hillslopes on hills on uplands

Position on hillslope: Shoulders and backslopes

Position on landform: Side slopes

Parent material: Loamy residuum weathered from siltstone

Slope: 3 to 5 percent

Surface runoff class: High

Soil depth: 20 to 40 inches to bedrock (paralithic)

Slowest permeability class of the soil to a depth of 60 inches or above a restrictive layer: Moderately slow

Slowest permeability class within a depth of 80 inches: Impermeable

Drainage class: Well drained

Available water capacity: About 6.8 inches

Depth to the top of the seasonal high water table: Greater than 6 feet

Flooding: None

Ponding: None

Land capability classification, nonirrigated: 3e

Ecological site number and name: R080AY056OK, Loamy Prairie PE 44-64

Typical profile:

A—0 to 7 inches; silt loam

BA—7 to 12 inches; silt loam

Bt1—12 to 26 inches; silty clay loam

Bt2—26 to 36 inches; silty clay loam

Cr—36 to 40 inches; bedrock

Ironmound

Extent: 25 percent of the map unit

Geomorphic setting: Hillslopes on hills on uplands

Position on hillslope: Backslopes and shoulders

Position on landform: Side slopes

Parent material: Loamy residuum weathered from sandstone and shale

Slope: 1 to 5 percent

Surface runoff class: Very high

Soil depth: 10 to 20 inches to bedrock (paralithic)

Slowest permeability class of the soil to a depth of 60 inches or above a restrictive layer: Moderate

Slowest permeability class within a depth of 80 inches: Impermeable

Drainage class: Well drained

Available water capacity: About 1.7 inches

Depth to the top of the seasonal high water table: Greater than 6 feet

Flooding: None

Ponding: None

Land capability classification, nonirrigated: 7s

Ecological site number and name: R080AY083OK, Shallow Prairie PE 44-64

Typical profile:

A—0 to 6 inches; very fine sandy loam

Bw—6 to 10 inches; very fine sandy loam

Cr—10 to 22 inches; bedrock

Additional Components

Grainola soils: 7 percent of the map unit

Renfrow soils: 6 percent of the map unit

Huska soils: 2 percent of the map unit

10—Teval silt loam, 3 to 8 percent slopes

Map Unit Setting

Major land resource area: 80A

Elevation: 800 to 1,300 feet

Mean annual precipitation: 26 to 40 inches

Mean annual air temperature: 57 to 64 degrees F

Frost-free period: 190 to 230 days

Major Component Description

Teval

Extent: 80 percent of the map unit

Geomorphic setting: Stream terraces in valleys

Position on landform: Treads

Supplement to the Soil Survey of Cleveland County, Oklahoma

Parent material: Loamy alluvium over deposits of sand or gravel
Slope: 3 to 8 percent
Surface runoff class: Medium
Soil depth: Greater than 60 inches
Slowest permeability class of the soil to a depth of 60 inches or above a restrictive layer: Moderate
Slowest permeability class within a depth of 80 inches: Moderate
Drainage class: Well drained
Available water capacity: About 7.9 inches
Depth to the top of the seasonal high water table: Greater than 6 feet
Flooding: None
Ponding: None
Land capability classification, nonirrigated: 4e
Ecological site number and name: R080AY056OK, Loamy Prairie PE 44-64
Typical profile:
A—0 to 5 inches; silt loam
BA—5 to 11 inches; loam
Bt—11 to 29 inches; gravelly sandy clay loam
C—29 to 80 inches; stratified very gravelly fine sand to very gravelly clay loam

Additional Components

Slaughterville soils: 10 percent of the map unit
Norge soils: 6 percent of the map unit
Harrah soils: 4 percent of the map unit

11—Dougherty-Konawa complex, 3 to 8 percent slopes

Map Unit Setting

Major land resource area: 84A
Elevation: 500 to 1,500 feet
Mean annual precipitation: 26 to 40 inches
Mean annual air temperature: 58 to 64 degrees F
Frost-free period: 190 to 230 days

Major Component Description

Dougherty

Extent: 50 percent of the map unit
Geomorphic setting: Dunes in dune fields on sandhills in valleys
Parent material: Sandy and loamy alluvium and/or sandy eolian deposits
Slope: 3 to 8 percent
Surface runoff class: Low
Soil depth: Greater than 60 inches
Slowest permeability class of the soil to a depth of 60 inches or above a restrictive layer: Moderate
Slowest permeability class within a depth of 80 inches: Moderate
Drainage class: Well drained
Available water capacity: About 6.3 inches
Depth to the top of the seasonal high water table: Greater than 6 feet
Flooding: None
Ponding: None
Land capability classification, nonirrigated: 4e
Ecological site number and name: R084AY018OK, Deep Sand Savannah PE 48-64
Typical profile:
A—0 to 7 inches; loamy fine sand

E—7 to 23 inches; loamy fine sand
Bt1—23 to 27 inches; fine sandy loam
Bt2—27 to 39 inches; sandy clay loam
Bt3—39 to 65 inches; fine sandy loam
C—65 to 80 inches; fine sandy loam

Konawa

Extent: 40 percent of the map unit
Geomorphic setting: Paleoterraces on uplands
Position on landform: Treads
Parent material: Loamy and sandy alluvium
Slope: 3 to 8 percent
Surface runoff class: Medium
Soil depth: Greater than 60 inches
Slowest permeability class of the soil to a depth of 60 inches or above a restrictive layer: Moderate
Slowest permeability class within a depth of 80 inches: Moderate
Drainage class: Well drained
Available water capacity: About 8.6 inches
Depth to the top of the seasonal high water table: Greater than 6 feet
Flooding: None
Ponding: None
Land capability classification, nonirrigated: 4e
Ecological site number and name: R084AY018OK, Deep Sand Savannah PE 48-64
Typical profile:
A—0 to 6 inches; loamy fine sand
E—6 to 15 inches; loamy fine sand
Bt1—15 to 37 inches; sandy clay loam
Bt2—37 to 58 inches; fine sandy loam
C—58 to 80 inches; fine sandy loam

Additional Components

Derby soils: 5 percent of the map unit
Slaughterville soils: 5 percent of the map unit

12—Derby loamy fine sand, 0 to 3 percent slopes

Map Unit Setting

Major land resource area: 84A
Elevation: 500 to 1,500 feet
Mean annual precipitation: 26 to 40 inches
Mean annual air temperature: 58 to 64 degrees F
Frost-free period: 190 to 230 days

Major Component Description

Derby

Extent: 80 percent of the map unit
Geomorphic setting: Dunes in dune fields on sandhills in valleys
Parent material: Sandy eolian deposits
Slope: 0 to 3 percent
Surface runoff class: Negligible
Soil depth: Greater than 60 inches
Slowest permeability class of the soil to a depth of 60 inches or above a restrictive layer: Rapid

Slowest permeability class within a depth of 80 inches: Rapid
Drainage class: Somewhat excessively drained
Available water capacity: About 4.8 inches
Depth to the top of the seasonal high water table: Greater than 6 feet
Flooding: None
Ponding: None
Land capability classification, nonirrigated: 3e
Ecological site number and name: R084AY018OK, Deep Sand Savannah PE 48-64
Typical profile:
A—0 to 10 inches; loamy fine sand
E—10 to 54 inches; loamy fine sand
E/Bt—54 to 84 inches; loamy fine sand

Additional Components

Dougherty soils: 10 percent of the map unit
Konawa soils: 6 percent of the map unit
Slaughterville soils: 4 percent of the map unit

13—Derby loamy fine sand, 3 to 15 percent slopes

Map Unit Setting

Major land resource area: 84A
Elevation: 500 to 1,500 feet
Mean annual precipitation: 26 to 40 inches
Mean annual air temperature: 58 to 64 degrees F
Frost-free period: 190 to 230 days

Major Component Description

Derby

Extent: 85 percent of the map unit
Geomorphic setting: Dunes in dune fields on sandhills in valleys
Parent material: Sandy eolian deposits
Slope: 3 to 15 percent
Surface runoff class: Very low
Soil depth: Greater than 60 inches
Slowest permeability class of the soil to a depth of 60 inches or above a restrictive layer: Rapid
Slowest permeability class within a depth of 80 inches: Rapid
Drainage class: Somewhat excessively drained
Available water capacity: About 4.8 inches
Depth to the top of the seasonal high water table: Greater than 6 feet
Flooding: None
Ponding: None
Land capability classification, nonirrigated: 6e
Ecological site number and name: R084AY018OK, Deep Sand Savannah PE 48-64
Typical profile:
A—0 to 11 inches; loamy fine sand
E—11 to 52 inches; loamy fine sand
E/Bt—52 to 84 inches; loamy fine sand

Additional Components

Dougherty soils: 6 percent of the map unit
Konawa soils: 6 percent of the map unit
Slaughterville soils: 3 percent of the map unit

14—Derby-Urban land complex, 3 to 15 percent slopes

Map Unit Setting

Major land resource area: 84A

Elevation: 500 to 2,000 feet

Mean annual precipitation: 22 to 40 inches

Mean annual air temperature: 57 to 64 degrees F

Frost-free period: 185 to 230 days

Major Component Description

Derby

Extent: 55 percent of the map unit

Geomorphic setting: Dunes in dune fields on sandhills in valleys

Parent material: Sandy eolian deposits

Slope: 3 to 15 percent

Surface runoff class: Very low

Soil depth: Greater than 60 inches

Slowest permeability class of the soil to a depth of 60 inches or above a restrictive layer: Rapid

Slowest permeability class within a depth of 80 inches: Rapid

Drainage class: Somewhat excessively drained

Available water capacity: About 4.8 inches

Depth to the top of the seasonal high water table: Greater than 6 feet

Flooding: None

Ponding: None

Land capability classification, nonirrigated: 6e

Typical profile:

A—0 to 6 inches; loamy fine sand

E—6 to 48 inches; loamy fine sand

E/Bt—48 to 84 inches; loamy fine sand

Urban land

Extent: 35 percent of the map unit

Geomorphic setting: Urban land

Parent material: Sandy mine spoil or earthy fill

Slope: 3 to 15 percent

Surface runoff class: Very high

Land capability classification, nonirrigated: 8

Additional Components

Dougherty soils: 4 percent of the map unit

Konawa soils: 4 percent of the map unit

Slaughterville soils: 2 percent of the map unit

15—Littleaxe loamy fine sand, 1 to 3 percent slopes

Map Unit Setting

Major land resource area: 84A

Elevation: 750 to 1,500 feet

Mean annual precipitation: 30 to 40 inches

Mean annual air temperature: 57 to 63 degrees F

Frost-free period: 200 to 230 days

Major Component Description

Littleaxe

Extent: 85 percent of the map unit

Geomorphic setting: Hillslopes on hills on uplands

Position on hillslope: Summits and shoulders

Parent material: Loamy residuum weathered from sandstone and shale

Slope: 1 to 3 percent

Surface runoff class: Low

Soil depth: 40 to 60 inches to bedrock (paralithic)

Slowest permeability class of the soil to a depth of 60 inches or above a restrictive layer: Moderate

Slowest permeability class within a depth of 80 inches: Moderately slow

Drainage class: Well drained

Available water capacity: About 6.6 inches

Depth to the top of the seasonal high water table: Greater than 6 feet

Flooding: None

Ponding: None

Land capability classification, nonirrigated: 3e

Ecological site number and name: R084AY075OK, Sandy Savannah PE 44-64

Typical profile:

A—0 to 7 inches; loamy fine sand

E—7 to 16 inches; loamy fine sand

Bt1—16 to 37 inches; sandy clay loam

Bt2—37 to 43 inches; fine sandy loam

BC—43 to 52 inches; fine sandy loam

Cr—52 to 60 inches; bedrock

Additional Components

Harrah soils: 10 percent of the map unit

Stephenville soils: 5 percent of the map unit

17—Gracemore silty clay loam, saline, 0 to 1 percent slopes, frequently flooded

Map Unit Setting

Major land resource area: 80A

Elevation: 700 to 2,200 feet

Mean annual precipitation: 22 to 38 inches

Mean annual air temperature: 57 to 64 degrees F

Frost-free period: 185 to 230 days

Major Component Description

Gracemore

Extent: 85 percent of the map unit

Geomorphic setting: Flood plains in river valleys

Parent material: Calcareous, sandy alluvium

Slope: 0 to 1 percent

Surface runoff class: High

Soil depth: Greater than 60 inches

Slowest permeability class of the soil to a depth of 60 inches or above a restrictive layer: Moderately rapid

Slowest permeability class within a depth of 80 inches: Moderately rapid

Drainage class: Somewhat poorly drained

Available water capacity: About 4.1 inches

Depth to the top of the seasonal high water table: 0.5 to 1.5 feet

Flooding: Frequent

Ponding: None

Other properties: Saline within a depth of 30 inches

Land capability classification, nonirrigated: 5w

Ecological site number and name: R080AY097OK, Subirrigated (Saline) PE 44-64

Typical profile:

A—0 to 7 inches; silty clay loam

C1—7 to 23 inches; stratified loamy fine sand to fine sandy loam

C2—23 to 80 inches; stratified fine sand to fine sandy loam

Additional Components

Gaddy soils: 10 percent of the map unit

Gracemont soils: 5 percent of the map unit

18—Gracemore loamy fine sand, 0 to 1 percent slopes, frequently flooded

Map Unit Setting

Major land resource area: 80A

Elevation: 700 to 2,200 feet

Mean annual precipitation: 22 to 38 inches

Mean annual air temperature: 57 to 64 degrees F

Frost-free period: 185 to 230 days

Major Component Description

Gracemore

Extent: 85 percent of the map unit

Geomorphic setting: Flood plains in river valleys

Parent material: Calcareous, sandy alluvium

Slope: 0 to 1 percent

Surface runoff class: High

Soil depth: Greater than 60 inches

Slowest permeability class of the soil to a depth of 60 inches or above a restrictive layer: Rapid

Slowest permeability class within a depth of 80 inches: Moderately rapid

Drainage class: Somewhat poorly drained

Available water capacity: About 4.4 inches

Depth to the top of the seasonal high water table: 0.5 to 1.5 feet

Flooding: Frequent

Ponding: None

Land capability classification, nonirrigated: 5w

Ecological site number and name: R080AY095OK, Subirrigated PE 44-64

Typical profile:

A—0 to 11 inches; loamy fine sand

C—11 to 84 inches; stratified fine sand to clay loam

Additional Components

Gaddy soils: 10 percent of the map unit

Gracemont soils: 5 percent of the map unit

19—Goodnight loamy fine sand, 5 to 20 percent slopes

Map Unit Setting

Major land resource area: 80A

Elevation: 700 to 1,500 feet

Mean annual precipitation: 26 to 40 inches

Mean annual air temperature: 57 to 64 degrees F

Frost-free period: 190 to 230 days

Major Component Description

Goodnight

Extent: 90 percent of the map unit

Geomorphic setting: Dunes in dune fields on sandhills in valleys

Parent material: Eolian sands

Slope: 5 to 20 percent

Surface runoff class: Very low

Soil depth: Greater than 60 inches

Slowest permeability class of the soil to a depth of 60 inches or above a restrictive layer: Rapid

Slowest permeability class within a depth of 80 inches: Rapid

Drainage class: Excessively drained

Available water capacity: About 4.2 inches

Depth to the top of the seasonal high water table: Greater than 6 feet

Flooding: Rare

Ponding: None

Land capability classification, nonirrigated: 6e

Ecological site number and name: R080AY014OK, Deep Sand PE 44-64

Typical profile:

A—0 to 5 inches; loamy fine sand

C1—5 to 22 inches; loamy fine sand

C2—22 to 80 inches; loamy fine sand

Additional Components

Lebron soils: 5 percent of the map unit

Slaughterville soils: 5 percent of the map unit

20—Tribbey fine sandy loam, 0 to 1 percent slopes, frequently flooded

Map Unit Setting

Major land resource area: 84A

Elevation: 700 to 1,500 feet

Mean annual precipitation: 26 to 40 inches

Mean annual air temperature: 57 to 65 degrees F

Frost-free period: 200 to 240 days

Major Component Description

Tribbey

Extent: 75 percent of the map unit

Geomorphic setting: Flood plains in river valleys

Parent material: Loamy and/or sandy alluvium

Slope: 0 to 1 percent

Surface runoff class: High

Soil depth: Greater than 60 inches

Slowest permeability class of the soil to a depth of 60 inches or above a restrictive layer: Moderately rapid

Slowest permeability class within a depth of 80 inches: Moderately rapid

Drainage class: Somewhat poorly drained

Available water capacity: About 8.3 inches

Depth to the top of the seasonal high water table: 0.5 to 3.5 feet

Flooding: Frequent

Ponding: None

Land capability classification, nonirrigated: 5w

Ecological site number and name: R084AY095OK, Subirrigated PE 48-64

Typical profile:

A—0 to 4 inches; fine sandy loam

C1—4 to 24 inches; stratified fine sandy loam to loam

C2—24 to 72 inches; stratified loamy fine sand to loam

Additional Components

Pulaski soils: 10 percent of the map unit

Ashport soils: 8 percent of the map unit

Easpur soils: 7 percent of the map unit

21—Pits

Map Unit Setting

Major land resource area: 80A

Elevation: 500 to 2,200 feet

Mean annual precipitation: 22 to 48 inches

Mean annual air temperature: 57 to 64 degrees F

Frost-free period: 190 to 240 days

Major Component Description

Pits

Extent: 100 percent of the map unit

Geomorphic setting: Borrow pits

Parent material: Mine spoil or earthy fill

Slope: 0 to 4 percent

Surface runoff class: High

Land capability classification, nonirrigated: 8

28—Kingfisher-Urban land-Ironmound complex, 1 to 5 percent slopes

Map Unit Setting

Major land resource area: 80A

Elevation: 700 to 2,000 feet

Mean annual precipitation: 22 to 40 inches

Mean annual air temperature: 57 to 64 degrees F

Frost-free period: 185 to 230 days

Major Component Description

Kingfisher

Extent: 45 percent of the map unit

Geomorphic setting: Hillslopes on hills on uplands

Position on hillslope: Shoulders and backslopes

Position on landform: Side slopes

Parent material: Loamy residuum weathered from siltstone

Slope: 3 to 5 percent

Surface runoff class: High

Soil depth: 20 to 40 inches to bedrock (paralithic)

Slowest permeability class of the soil to a depth of 60 inches or above a restrictive layer: Moderately slow

Slowest permeability class within a depth of 80 inches: Impermeable

Drainage class: Well drained

Available water capacity: About 5.0 inches

Depth to the top of the seasonal high water table: Greater than 6 feet

Flooding: None

Ponding: None

Land capability classification, nonirrigated: 3e

Typical profile:

A—0 to 5 inches; silt loam

BA—5 to 9 inches; silt loam

Bt1—9 to 20 inches; silty clay loam

Bt2—20 to 26 inches; silty clay loam

Cr—26 to 30 inches; bedrock

Urban land

Extent: 30 percent of the map unit

Geomorphic setting: Urban land

Parent material: Loamy mine spoil or earthy fill derived from sandstone and siltstone

Slope: 1 to 5 percent

Surface runoff class: Very high

Land capability classification, nonirrigated: 8

Ironmound

Extent: 15 percent of the map unit

Geomorphic setting: Hillslopes on hills on uplands

Position on hillslope: Shoulders and backslopes

Position on landform: Side slopes

Parent material: Loamy residuum weathered from sandstone and shale

Slope: 3 to 5 percent

Surface runoff class: Very high

Soil depth: 10 to 20 inches to bedrock (paralithic)

Slowest permeability class of the soil to a depth of 60 inches or above a restrictive layer: Moderate

Slowest permeability class within a depth of 80 inches: Impermeable

Drainage class: Well drained

Available water capacity: About 2.4 inches

Depth to the top of the seasonal high water table: Greater than 6 feet

Flooding: None

Ponding: None

Land capability classification, nonirrigated: 4s

Typical profile:

A—0 to 5 inches; very fine sandy loam

Bw—5 to 14 inches; very fine sandy loam

Cr—14 to 22 inches; bedrock

Additional Components

Grainola soils: 6 percent of the map unit

Renfrow soils: 4 percent of the map unit

29—Ironmound very fine sandy loam, 5 to 8 percent slopes

Map Unit Setting

Major land resource area: 80A

Elevation: 700 to 1,500 feet

Mean annual precipitation: 26 to 40 inches

Mean annual air temperature: 57 to 64 degrees F

Frost-free period: 190 to 230 days

Major Component Description

Ironmound

Extent: 90 percent of the map unit

Geomorphic setting: Hillslopes on hills on uplands

Position on hillslope: Shoulders and backslopes

Position on landform: Side slopes

Parent material: Loamy residuum weathered from sandstone and shale

Slope: 5 to 8 percent

Surface runoff class: Very high

Soil depth: 10 to 20 inches to bedrock (paralithic)

Slowest permeability class of the soil to a depth of 60 inches or above a restrictive layer: Moderate

Slowest permeability class within a depth of 80 inches: Impermeable

Drainage class: Well drained

Available water capacity: About 1.8 inches

Depth to the top of the seasonal high water table: Greater than 6 feet

Flooding: None

Ponding: None

Land capability classification, nonirrigated: 6e

Ecological site number and name: R080AY083OK, Shallow Prairie PE 44-64

Typical profile:

A—0 to 4 inches; very fine sandy loam

Bw—4 to 11 inches; loam

Cr—11 to 19 inches; bedrock

Additional Components

Grainola soils: 5 percent of the map unit

Renfrow soils: 3 percent of the map unit

Huska soils: 2 percent of the map unit

30—Brewless silty clay loam, 0 to 1 percent slopes, rarely flooded

Map Unit Setting

Major land resource area: 80A

Elevation: 700 to 1,500 feet

Mean annual precipitation: 26 to 40 inches

Mean annual air temperature: 57 to 64 degrees F

Frost-free period: 190 to 230 days

Major Component Description

Brewless

Extent: 90 percent of the map unit

Geomorphic setting: Flood plains in river valleys

Parent material: Loamy and clayey alluvium

Slope: 0 to 1 percent

Surface runoff class: Medium

Soil depth: Greater than 60 inches

Slowest permeability class of the soil to a depth of 60 inches or above a restrictive layer: Slow

Slowest permeability class within a depth of 80 inches: Slow

Drainage class: Moderately well drained

Available water capacity: About 8.9 inches

Depth to the top of the seasonal high water table: Greater than 6 feet

Flooding: Rare

Ponding: None

Land capability classification, nonirrigated: 1

Ecological site number and name: R080AY045OK, Heavy Bottomland PE 44-64

Typical profile:

Ap—0 to 9 inches; silty clay loam

Bt—9 to 24 inches; silty clay

Btk—24 to 44 inches; silty clay loam

Ck—44 to 84 inches; stratified loamy fine sand to silty clay

Additional Components

Lomill soils: 4 percent of the map unit

Asher soils: 3 percent of the map unit

Lebron soils: 3 percent of the map unit

32—Lomill silty clay, 0 to 1 percent slopes, occasionally flooded

Map Unit Setting

Major land resource area: 80A

Elevation: 700 to 1,500 feet

Mean annual precipitation: 26 to 40 inches

Mean annual air temperature: 57 to 65 degrees F

Frost-free period: 200 to 230 days

Major Component Description

Lomill

Extent: 94 percent of the map unit

Geomorphic setting: Flood plains in river valleys

Parent material: Calcareous, clayey alluvium over loamy alluvium

Slope: 0 to 1 percent

Surface runoff class: High

Soil depth: Greater than 60 inches

Slowest permeability class of the soil to a depth of 60 inches or above a restrictive layer: Very slow

Slowest permeability class within a depth of 80 inches: Very slow

Drainage class: Somewhat poorly drained

Available water capacity: About 8.1 inches

Depth to the top of the seasonal high water table: 2.5 to 6.0 feet

Flooding: Occasional

Ponding: None

Land capability classification, nonirrigated: 4w

Ecological site number and name: R080AY045OK, Heavy Bottomland PE 44-64

Typical profile:

Ap—0 to 13 inches; silty clay
Bw—13 to 25 inches; silty clay
Ck1—25 to 34 inches; silty clay
2CK2—34 to 60 inches; stratified loamy fine sand to silty clay

Additional Components

Asher soils: 4 percent of the map unit

Ashport soils: 2 percent of the map unit

33—Norge-Ashport complex, 0 to 8 percent slopes

Map Unit Setting

Major land resource area: 80A

Elevation: 700 to 1,500 feet

Mean annual precipitation: 26 to 40 inches

Mean annual air temperature: 57 to 65 degrees F

Frost-free period: 190 to 240 days

Major Component Description

Norge

Extent: 60 percent of the map unit

Geomorphic setting: Paleoterraces on uplands

Position on landform: Treads

Parent material: Loamy alluvium

Slope: 3 to 8 percent

Surface runoff class: High

Soil depth: Greater than 60 inches

Slowest permeability class of the soil to a depth of 60 inches or above a restrictive layer: Moderately slow

Slowest permeability class within a depth of 80 inches: Moderately slow

Drainage class: Well drained

Available water capacity: About 11.4 inches

Depth to the top of the seasonal high water table: Greater than 6 feet

Flooding: None

Ponding: None

Land capability classification, nonirrigated: 4e

Ecological site number and name: R080AY056OK, Loamy Prairie PE 44-64

Typical profile:

A—0 to 12 inches; silt loam

BA—12 to 16 inches; silty clay loam

Bt1—16 to 54 inches; silty clay loam

Bt2—54 to 74 inches; silty clay loam

Ashport

Extent: 15 percent of the map unit

Geomorphic setting: Flood plains in river valleys

Parent material: Fine-silty alluvium

Slope: 0 to 3 percent

Surface runoff class: Low

Soil depth: Greater than 60 inches

Slowest permeability class of the soil to a depth of 60 inches or above a restrictive layer: Moderate

Slowest permeability class within a depth of 80 inches: Moderate

Drainage class: Well drained

Available water capacity: About 11.8 inches

Depth to the top of the seasonal high water table: Greater than 6 feet

Flooding: Frequent

Ponding: None

Land capability classification, nonirrigated: 5w

Ecological site number and name: R080AY050OK, Loamy Bottomland PE 44-64

Typical profile:

A—0 to 16 inches; silt loam

Bw1—16 to 45 inches; silt loam

Bw2—45 to 54 inches; silt loam

Ck—54 to 80 inches; stratified silt loam to silty clay loam

Additional Components

Grainola soils: 8 percent of the map unit

Ironmound soils: 8 percent of the map unit

Pulaski soils: 5 percent of the map unit

Lebron soils: 2 percent of the map unit

Slaughterville soils: 2 percent of the map unit

34—Brewless-Urban land complex, 0 to 1 percent slopes, rarely flooded

Map Unit Setting

Major land resource area: 80A

Elevation: 700 to 2,000 feet

Mean annual precipitation: 22 to 40 inches

Mean annual air temperature: 57 to 64 degrees F

Frost-free period: 185 to 230 days

Major Component Description

Brewless

Extent: 50 percent of the map unit

Geomorphic setting: Flood plains in river valleys

Parent material: Loamy and clayey alluvium

Slope: 0 to 1 percent

Surface runoff class: Medium

Soil depth: Greater than 60 inches

Slowest permeability class of the soil to a depth of 60 inches or above a restrictive layer: Slow

Slowest permeability class within a depth of 80 inches: Slow

Drainage class: Moderately well drained

Available water capacity: About 8.9 inches

Depth to the top of the seasonal high water table: Greater than 6 feet

Flooding: Rare

Ponding: None

Land capability classification, nonirrigated: 1

Typical profile:

A—0 to 11 inches; silty clay loam

Bt—11 to 27 inches; silty clay

Btk—27 to 41 inches; clay loam

Ck—41 to 84 inches; stratified loamy fine sand to silty clay

Urban land

Extent: 40 percent of the map unit

Geomorphic setting: Urban land

Parent material: Silty and clayey mine spoil or earthy fill

Slope: 0 to 1 percent

Surface runoff class: Very high

Land capability classification, nonirrigated: 8

Additional Components

Lomill soils: 5 percent of the map unit

Keokuk soils: 3 percent of the map unit

Canadian soils: 2 percent of the map unit

35—Stephenville-Darsil-Newalla complex, 3 to 8 percent slopes, eroded

Map Unit Setting

Major land resource area: 84A

Elevation: 750 to 1,500 feet

Mean annual precipitation: 26 to 40 inches

Mean annual air temperature: 57 to 64 degrees F

Frost-free period: 200 to 230 days

Major Component Description

Stephenville

Extent: 47 percent of the map unit

Geomorphic setting: Hillslopes on hills on uplands

Position on hillslope: Shoulders and backslopes

Parent material: Loamy residuum weathered from sandstone

Slope: 3 to 8 percent

Surface runoff class: Medium

Soil depth: 20 to 40 inches to bedrock (paralithic)

Slowest permeability class of the soil to a depth of 60 inches or above a restrictive layer: Moderate

Slowest permeability class within a depth of 80 inches: Moderately slow

Drainage class: Well drained

Available water capacity: About 4.0 inches

Depth to the top of the seasonal high water table: Greater than 6 feet

Flooding: None

Ponding: None

Land capability classification, nonirrigated: 4e

Ecological site number and name: R084AY876OK, Eroded Sandy Savannah PE
48-64

Typical profile:

A—0 to 3 inches; fine sandy loam

E—3 to 8 inches; fine sandy loam

Bt—8 to 26 inches; sandy clay loam

Cr—26 to 36 inches; bedrock

Darsil

Extent: 20 percent of the map unit

Geomorphic setting: Hillslopes on hills on uplands

Position on hillslope: Backslopes

Supplement to the Soil Survey of Cleveland County, Oklahoma

Parent material: Sandy residuum weathered from sandstone
Slope: 3 to 8 percent
Surface runoff class: High
Soil depth: 10 to 20 inches to bedrock (paralithic)
Slowest permeability class of the soil to a depth of 60 inches or above a restrictive layer: Rapid
Slowest permeability class within a depth of 80 inches: Moderately slow
Drainage class: Excessively drained
Available water capacity: About 1.2 inches
Depth to the top of the seasonal high water table: Greater than 6 feet
Flooding: None
Ponding: None
Land capability classification, nonirrigated: 6e
Ecological site number and name: R084AY889OK, Eroded Shallow Savannah PE 48-64
Typical profile:
A—0 to 7 inches; loamy fine sand
EC—7 to 14 inches; loamy fine sand
Cr—14 to 20 inches; bedrock

Newalla

Extent: 15 percent of the map unit
Geomorphic setting: Hillslopes on hills on uplands
Position on hillslope: Backslopes
Parent material: Loamy residuum weathered from sandstone over clayey residuum weathered from shale
Slope: 3 to 8 percent
Surface runoff class: Very high
Soil depth: 40 to 60 inches to bedrock (paralithic)
Slowest permeability class of the soil to a depth of 60 inches or above a restrictive layer: Very slow
Slowest permeability class within a depth of 80 inches: Very slow
Drainage class: Moderately well drained
Available water capacity: About 6.0 inches
Depth to the top of the seasonal high water table: Greater than 6 feet
Flooding: None
Ponding: None
Land capability classification, nonirrigated: 4e
Ecological site number and name: R084AY876OK, Eroded Sandy Savannah PE 48-64
Typical profile:
A—0 to 4 inches; fine sandy loam
Bt1—4 to 8 inches; sandy clay loam
2Bt2—8 to 32 inches; silty clay
2Bt3—32 to 42 inches; silty clay
2Cr—42 to 60 inches; bedrock

Additional Components

Harrah soils: 10 percent of the map unit
Derby soils: 5 percent of the map unit
Grainola soils: 3 percent of the map unit

36—Stephenville-Darsil complex, 1 to 5 percent slopes, eroded

Map Unit Setting

Major land resource area: 84A

Elevation: 750 to 1,500 feet

Mean annual precipitation: 28 to 40 inches

Mean annual air temperature: 57 to 64 degrees F

Frost-free period: 200 to 230 days

Major Component Description

Stephenville

Extent: 75 percent of the map unit

Geomorphic setting: Hillslopes on hills on uplands

Position on hillslope: Backslopes and shoulders

Parent material: Loamy residuum weathered from sandstone

Slope: 1 to 5 percent

Surface runoff class: Low

Soil depth: 20 to 40 inches to bedrock (paralithic)

Slowest permeability class of the soil to a depth of 60 inches or above a restrictive layer: Moderate

Slowest permeability class within a depth of 80 inches: Moderately slow

Drainage class: Well drained

Available water capacity: About 3.8 inches

Depth to the top of the seasonal high water table: Greater than 6 feet

Flooding: None

Ponding: None

Land capability classification, nonirrigated: 4e

Ecological site number and name: R084AY876OK, Eroded Sandy Savannah PE
48-64

Typical profile:

A—0 to 7 inches; fine sandy loam

Bt1—7 to 18 inches; sandy clay loam

Bt2—18 to 24 inches; fine sandy loam

Cr—24 to 30 inches; bedrock

Darsil

Extent: 15 percent of the map unit

Geomorphic setting: Hillslopes on hills on uplands

Position on hillslope: Backslopes

Parent material: Sandy residuum weathered from sandstone

Slope: 1 to 5 percent

Surface runoff class: Medium

Soil depth: 10 to 20 inches to bedrock (paralithic)

Slowest permeability class of the soil to a depth of 60 inches or above a restrictive layer: Rapid

Slowest permeability class within a depth of 80 inches: Moderately slow

Drainage class: Excessively drained

Available water capacity: About 1.1 inches

Depth to the top of the seasonal high water table: Greater than 6 feet

Flooding: None

Ponding: None

Land capability classification, nonirrigated: 4s

Ecological site number and name: R084AY889OK, Eroded Shallow Savannah PE
48-64

Typical profile:

A—0 to 6 inches; loamy fine sand
EC—6 to 13 inches; loamy fine sand
Cr—13 to 20 inches; bedrock

Additional Components

Harrah soils: 5 percent of the map unit

Darnell soils: 3 percent of the map unit

Newalla soils: 2 percent of the map unit

37—Harrah fine sandy loam, 5 to 8 percent slopes, eroded

Map Unit Setting

Major land resource area: 84A

Elevation: 700 to 1,500 feet

Mean annual precipitation: 26 to 40 inches

Mean annual air temperature: 57 to 63 degrees F

Frost-free period: 200 to 240 days

Major Component Description

Harrah

Extent: 75 percent of the map unit

Geomorphic setting: Hillslopes on hills on uplands

Position on hillslope: Backslopes

Parent material: Loamy and sandy colluvium derived from sandstone

Slope: 5 to 8 percent

Surface runoff class: Medium

Soil depth: Greater than 60 inches

Slowest permeability class of the soil to a depth of 60 inches or above a restrictive layer: Moderate

Slowest permeability class within a depth of 80 inches: Moderate

Drainage class: Well drained

Available water capacity: About 8.1 inches

Depth to the top of the seasonal high water table: Greater than 6 feet

Flooding: None

Ponding: None

Land capability classification, nonirrigated: 4e

Ecological site number and name: R084AY876OK, Eroded Sandy Savannah PE

48-64

Typical profile:

A—0 to 5 inches; fine sandy loam
E—5 to 10 inches; loamy fine sand
Bt1—10 to 60 inches; sandy clay loam
Bt2—60 to 71 inches; fine sandy loam
Btb—71 to 80 inches; sandy clay loam

Additional Components

Littleaxe soils: 8 percent of the map unit

Stephenville soils: 7 percent of the map unit

Derby soils: 5 percent of the map unit

Pulaski soils: 3 percent of the map unit

Tribbey soils: 2 percent of the map unit

38—Asher-Urban land complex, 0 to 1 percent slopes, rarely flooded

Map Unit Setting

Major land resource area: 80A

Elevation: 700 to 2,000 feet

Mean annual precipitation: 22 to 40 inches

Mean annual air temperature: 57 to 64 degrees F

Frost-free period: 185 to 230 days

Major Component Description

Asher

Extent: 55 percent of the map unit

Geomorphic setting: Flood plains in river valleys

Parent material: Fine-silty alluvium

Slope: 0 to 1 percent

Surface runoff class: Medium

Soil depth: Greater than 60 inches

Slowest permeability class of the soil to a depth of 60 inches or above a restrictive layer: Slow

Slowest permeability class within a depth of 80 inches: Slow

Drainage class: Moderately well drained

Available water capacity: About 10.3 inches

Depth to the top of the seasonal high water table: 3.5 to 6.0 feet

Flooding: Rare

Ponding: None

Land capability classification, nonirrigated: 1

Typical profile:

A—0 to 13 inches; silt loam

Bk—13 to 24 inches; silty clay loam

Ck1—24 to 77 inches; stratified loamy very fine sand to silty clay

2Ck2—77 to 80 inches; stratified fine sand to loamy fine sand

Urban land

Extent: 40 percent of the map unit

Geomorphic setting: Urban land

Parent material: Fine-silty mine spoil or earthy fill

Slope: 0 to 1 percent

Surface runoff class: Very high

Land capability classification, nonirrigated: 8

Additional Components

Keokuk soils: 2 percent of the map unit

Lomill soils: 2 percent of the map unit

Lebron soils: 1 percent of the map unit

39—Asher silt loam, 0 to 1 percent slopes, clayey substratum, rarely flooded

Map Unit Setting

Major land resource area: 80A

Elevation: 700 to 1,500 feet

Mean annual precipitation: 26 to 40 inches

Supplement to the Soil Survey of Cleveland County, Oklahoma

Mean annual air temperature: 57 to 64 degrees F

Frost-free period: 190 to 230 days

Major Component Description

Asher

Extent: 80 percent of the map unit

Geomorphic setting: Flood plains in river valleys

Parent material: Fine-silty alluvium

Slope: 0 to 1 percent

Surface runoff class: Medium

Soil depth: Greater than 60 inches

Slowest permeability class of the soil to a depth of 60 inches or above a restrictive layer: Slow

Slowest permeability class within a depth of 80 inches: Slow

Drainage class: Moderately well drained

Available water capacity: About 10.5 inches

Depth to the top of the seasonal high water table: 3.5 to 6.0 feet

Flooding: Rare

Ponding: None

Land capability classification, nonirrigated: 1

Ecological site number and name: R080AY050OK, Loamy Bottomland PE 44-64

Typical profile:

Ap—0 to 11 inches; silt loam

Bk—11 to 30 inches; silty clay loam

2Ck1—30 to 69 inches; stratified loamy very fine sand to silty clay

2Ck2—69 to 80 inches; stratified fine sand to loamy fine sand

Additional Components

Lomill soils: 10 percent of the map unit

Keokuk soils: 8 percent of the map unit

Lebron soils: 2 percent of the map unit

40—Asher silty clay loam, 0 to 1 percent slopes, clayey substratum, rarely flooded

Map Unit Setting

Major land resource area: 80A

Elevation: 700 to 1,500 feet

Mean annual precipitation: 26 to 40 inches

Mean annual air temperature: 57 to 64 degrees F

Frost-free period: 190 to 230 days

Major Component Description

Asher

Extent: 85 percent of the map unit

Geomorphic setting: Flood plains in river valleys

Parent material: Fine-silty alluvium

Slope: 0 to 1 percent

Surface runoff class: Medium

Soil depth: Greater than 60 inches

Slowest permeability class of the soil to a depth of 60 inches or above a restrictive layer: Slow

Slowest permeability class within a depth of 80 inches: Slow

Drainage class: Moderately well drained

Available water capacity: About 10.6 inches

Depth to the top of the seasonal high water table: 3.5 to 6.0 feet

Flooding: Rare

Ponding: None

Land capability classification, nonirrigated: 1

Ecological site number and name: R080AY050OK, Loamy Bottomland PE 44-64

Typical profile:

Ap—0 to 8 inches; silty clay loam

Bk—8 to 35 inches; silty clay loam

2Ck1—35 to 50 inches; stratified loamy very fine sand to silty clay

2Ck2—50 to 80 inches; stratified silty clay to loamy very fine sand

Additional Components

Lomill soils: 8 percent of the map unit

Keokuk soils: 4 percent of the map unit

Canadian soils: 2 percent of the map unit

Lebron soils: 1 percent of the map unit

41—Asher silty clay loam, saline, 0 to 1 percent slopes, occasionally flooded

Map Unit Setting

Major land resource area: 80A

Elevation: 700 to 1,500 feet

Mean annual precipitation: 26 to 40 inches

Mean annual air temperature: 57 to 64 degrees F

Frost-free period: 190 to 230 days

Major Component Description

Asher

Extent: 95 percent of the map unit

Geomorphic setting: Flood plains in river valleys

Parent material: Fine-silty alluvium

Slope: 0 to 1 percent

Surface runoff class: Very high

Soil depth: Greater than 60 inches

Slowest permeability class of the soil to a depth of 60 inches or above a restrictive layer: Slow

Slowest permeability class within a depth of 80 inches: Slow

Drainage class: Somewhat poorly drained

Available water capacity: About 9.1 inches

Depth to the top of the seasonal high water table: 1.5 to 3.5 feet

Flooding: Occasional

Ponding: None

Other properties: Saline within a depth of 30 inches

Land capability classification, nonirrigated: 4s

Ecological site number and name: R080AY097OK, Subirrigated (Saline) PE 44-64

Typical profile:

Ap—0 to 11 inches; silty clay loam

C1—11 to 21 inches; very fine sandy loam

C2—21 to 28 inches; silty clay loam

Ck—28 to 36 inches; silty clay loam

2C—36 to 51 inches; fine sand

2Ck—51 to 78 inches; stratified fine sand to silty clay

Additional Components

Keokuk soils: 2 percent of the map unit

Lomill soils: 2 percent of the map unit

Lebron soils: 1 percent of the map unit

42—Canadian fine sandy loam, 0 to 1 percent slopes, rarely flooded

Map Unit Setting

Major land resource area: 80A

Elevation: 700 to 1,500 feet

Mean annual precipitation: 26 to 40 inches

Mean annual air temperature: 57 to 64 degrees F

Frost-free period: 185 to 230 days

Major Component Description

Canadian

Extent: 80 percent of the map unit

Geomorphic setting: Flood plains in river valleys

Parent material: Loamy alluvium

Slope: 0 to 1 percent

Surface runoff class: Negligible

Soil depth: Greater than 60 inches

Slowest permeability class of the soil to a depth of 60 inches or above a restrictive layer: Moderately rapid

Slowest permeability class within a depth of 80 inches: Moderately rapid

Drainage class: Well drained

Available water capacity: About 8.4 inches

Depth to the top of the seasonal high water table: Greater than 6 feet

Flooding: Rare

Ponding: None

Land capability classification, nonirrigated: 1

Ecological site number and name: R080AY050OK, Loamy Bottomland PE 44-64

Typical profile:

Ap—0 to 19 inches; fine sandy loam

Bw—19 to 56 inches; fine sandy loam

C—56 to 80 inches; fine sandy loam

Additional Components

Asher soils: 10 percent of the map unit

Yahola soils: 8 percent of the map unit

Reinach soils: 2 percent of the map unit

49—Kirkland-Urban land-Pawhuska complex, 0 to 3 percent slopes

Map Unit Setting

Major land resource area: 80A

Elevation: 700 to 2,000 feet

Mean annual precipitation: 22 to 40 inches

Mean annual air temperature: 57 to 64 degrees F

Frost-free period: 185 to 230 days

Major Component Description

Kirkland

Extent: 40 percent of the map unit

Geomorphic setting: Plains on paleoterraces on uplands

Position on landform: Treads

Parent material: Clayey alluvium over clayey residuum weathered from calcareous shale

Slope: 1 to 3 percent

Surface runoff class: Very high

Soil depth: Greater than 60 inches

Slowest permeability class of the soil to a depth of 60 inches or above a restrictive layer: Very slow

Slowest permeability class within a depth of 80 inches: Very slow

Drainage class: Well drained

Available water capacity: About 8.4 inches

Depth to the top of the seasonal high water table: Greater than 6 feet

Flooding: None

Ponding: None

Land capability classification, nonirrigated: 3e

Typical profile:

A—0 to 9 inches; silt loam

BA—9 to 12 inches; silt loam

Btkss—12 to 40 inches; silty clay

Btk—40 to 80 inches; silty clay

Urban land

Extent: 40 percent of the map unit

Geomorphic setting: Urban land

Parent material: Clayey mine spoil or earthy fill

Slope: 0 to 3 percent

Surface runoff class: Very high

Land capability classification, nonirrigated: 8

Pawhuska

Extent: 15 percent of the map unit

Geomorphic setting: Hillslopes on hills on uplands

Position on hillslope: Summits

Parent material: Saline, clayey residuum weathered from sandstone and shale

Slope: 1 to 3 percent

Surface runoff class: Very high

Soil depth: Greater than 60 inches

Slowest permeability class of the soil to a depth of 60 inches or above a restrictive layer: Very slow

Slowest permeability class within a depth of 80 inches: Very slow

Drainage class: Moderately well drained

Available water capacity: About 7.8 inches

Depth to the top of the seasonal high water table: Greater than 6 feet

Flooding: None

Ponding: None

Other properties: Saline within a depth of 30 inches; sodic within a depth of 30 inches

Land capability classification, nonirrigated: 4s

Typical profile:

A—0 to 6 inches; silt loam

Btn—6 to 17 inches; silty clay

Btkn1—17 to 51 inches; silty clay

Btkn2—51 to 72 inches; silty clay

Additional Components

Bethany soils: 3 percent of the map unit
Renfrow soils: 2 percent of the map unit

50—Kirkland silt loam, 0 to 1 percent slopes

Map Unit Setting

Major land resource area: 80A
Elevation: 900 to 1,500 feet
Mean annual precipitation: 26 to 40 inches
Mean annual air temperature: 57 to 64 degrees F
Frost-free period: 190 to 230 days

Major Component Description

Kirkland

Extent: 85 percent of the map unit
Geomorphic setting: Plains on paleoterraces on uplands
Position on landform: Treads
Parent material: Clayey alluvium over clayey residuum weathered from calcareous shale
Slope: 0 to 1 percent
Surface runoff class: High
Soil depth: Greater than 60 inches
Slowest permeability class of the soil to a depth of 60 inches or above a restrictive layer: Very slow
Slowest permeability class within a depth of 80 inches: Very slow
Drainage class: Well drained
Available water capacity: About 8.6 inches
Depth to the top of the seasonal high water table: Greater than 6 feet
Flooding: None
Ponding: None
Other properties: Sodic within a depth of 30 inches
Land capability classification, nonirrigated: 2s
Ecological site number and name: R080AY010OK, Claypan Prairie (North) PE 44-64
Typical profile:
A—0 to 9 inches; silt loam
BA—9 to 11 inches; silt loam
Bt—11 to 25 inches; silty clay
Btk1—25 to 58 inches; silty clay loam
Btk2—58 to 80 inches; silty clay

Additional Components

Bethany soils: 9 percent of the map unit
Renfrow soils: 6 percent of the map unit

51—Kirkland-Pawhuska complex, 0 to 3 percent slopes

Map Unit Setting

Major land resource area: 80A
Elevation: 700 to 2,200 feet
Mean annual precipitation: 22 to 40 inches
Mean annual air temperature: 57 to 64 degrees F
Frost-free period: 185 to 230 days

Major Component Description

Kirkland

Extent: 70 percent of the map unit

Geomorphic setting: Plains on paleoterraces on uplands

Position on landform: Treads

Parent material: Clayey alluvium over clayey residuum weathered from calcareous shale

Slope: 0 to 3 percent

Surface runoff class: Very high

Soil depth: Greater than 60 inches

Slowest permeability class of the soil to a depth of 60 inches or above a restrictive layer: Very slow

Slowest permeability class within a depth of 80 inches: Very slow

Drainage class: Well drained

Available water capacity: About 8.6 inches

Depth to the top of the seasonal high water table: Greater than 6 feet

Flooding: None

Ponding: None

Land capability classification, nonirrigated: 2e

Ecological site number and name: R080AY010OK, Claypan Prairie (North) PE 44-64

Typical profile:

Ap—0 to 11 inches; silt loam

BA—11 to 13 inches; silt loam

Btkss—13 to 36 inches; silty clay

Btk—36 to 80 inches; silty clay

Pawhuska

Extent: 15 percent of the map unit

Geomorphic setting: Hillslopes on hills on uplands

Position on hillslope: Summits

Parent material: Saline, clayey residuum weathered from sandstone and shale

Slope: 0 to 3 percent

Surface runoff class: Very high

Soil depth: Greater than 60 inches

Slowest permeability class of the soil to a depth of 60 inches or above a restrictive layer: Very slow

Slowest permeability class within a depth of 80 inches: Very slow

Drainage class: Moderately well drained

Available water capacity: About 7.9 inches

Depth to the top of the seasonal high water table: Greater than 6 feet

Flooding: None

Ponding: None

Other properties: Saline within a depth of 30 inches; sodic within a depth of 30 inches

Land capability classification, nonirrigated: 4s

Ecological site number and name: R080AY091OK, Slickspot PE 44-64

Typical profile:

Ap—0 to 10 inches; silt loam

Btkn1—10 to 43 inches; silty clay

Btkn2—43 to 80 inches; silty clay

Additional Components

Bethany soils: 9 percent of the map unit

Renfrow soils: 5 percent of the map unit

Carwile soils: 1 percent of the map unit

52—Bethany-Pawhuska complex, 0 to 3 percent slopes

Map Unit Setting

Major land resource area: 80A

Elevation: 700 to 1,500 feet

Mean annual precipitation: 26 to 40 inches

Mean annual air temperature: 57 to 64 degrees F

Frost-free period: 190 to 230 days

Major Component Description

Bethany

Extent: 60 percent of the map unit

Geomorphic setting: Plains on paleoterraces on uplands

Position on landform: Treads

Parent material: Silty alluvium over clayey residuum weathered from shale

Slope: 0 to 3 percent

Surface runoff class: High

Soil depth: Greater than 60 inches

Slowest permeability class of the soil to a depth of 60 inches or above a restrictive layer: Slow

Slowest permeability class within a depth of 80 inches: Slow

Drainage class: Well drained

Available water capacity: About 10.5 inches

Depth to the top of the seasonal high water table: Greater than 6 feet

Flooding: None

Ponding: None

Land capability classification, nonirrigated: 2e

Ecological site number and name: R080AY056OK, Loamy Prairie PE 44-64

Typical profile:

Ap—0 to 12 inches; silt loam

BA—12 to 17 inches; silty clay loam

Bt—17 to 27 inches; silty clay loam

Btk1—27 to 43 inches; silty clay

Btk2—43 to 80 inches; silty clay loam

Pawhuska

Extent: 20 percent of the map unit

Geomorphic setting: Hillslopes on hills on uplands

Position on hillslope: Summits

Parent material: Saline, clayey residuum weathered from sandstone and shale

Slope: 0 to 3 percent

Surface runoff class: Very high

Soil depth: Greater than 60 inches

Slowest permeability class of the soil to a depth of 60 inches or above a restrictive layer: Very slow

Slowest permeability class within a depth of 80 inches: Very slow

Drainage class: Moderately well drained

Available water capacity: About 7.9 inches

Depth to the top of the seasonal high water table: Greater than 6 feet

Flooding: None

Ponding: None

Other properties: Saline within a depth of 30 inches; sodic within a depth of 30 inches

Land capability classification, nonirrigated: 4s

Ecological site number and name: R080AY091OK, Slickspot PE 44-64

Typical profile:

Ap—0 to 9 inches; silt loam
Btkn1—9 to 43 inches; silty clay
Btkn2—43 to 72 inches; silty clay

Additional Components

Kirkland soils: 10 percent of the map unit
Renfrow soils: 10 percent of the map unit

53—Kirkland-Pawhuska complex, 0 to 3 percent slopes, eroded

Map Unit Setting

Major land resource area: 80A
Elevation: 700 to 1,500 feet
Mean annual precipitation: 26 to 40 inches
Mean annual air temperature: 57 to 64 degrees F
Frost-free period: 190 to 230 days

Major Component Description

Kirkland

Extent: 70 percent of the map unit
Geomorphic setting: Plains on paleoterraces on uplands
Position on landform: Treads
Parent material: Clayey alluvium over clayey residuum weathered from calcareous shale
Slope: 0 to 3 percent
Surface runoff class: Very high
Soil depth: Greater than 60 inches
Slowest permeability class of the soil to a depth of 60 inches or above a restrictive layer: Very slow
Slowest permeability class within a depth of 80 inches: Very slow
Drainage class: Well drained
Available water capacity: About 7.9 inches
Depth to the top of the seasonal high water table: Greater than 6 feet
Flooding: None
Ponding: None
Land capability classification, nonirrigated: 3e
Ecological site number and name: R080AY810OK, Eroded Claypan Prairie (North)
PE 44-64
Typical profile:

Ap—0 to 8 inches; silt loam
Btkss1—8 to 51 inches; silty clay
Btkss2—51 to 76 inches; silty clay
Btk—76 to 80 inches; silty clay loam

Pawhuska

Extent: 15 percent of the map unit
Geomorphic setting: Hillslopes on hills on uplands
Position on hillslope: Summits
Parent material: Saline, clayey residuum weathered from sandstone and shale
Slope: 0 to 3 percent
Surface runoff class: Very high

Soil depth: Greater than 60 inches

Slowest permeability class of the soil to a depth of 60 inches or above a restrictive layer: Very slow

Slowest permeability class within a depth of 80 inches: Very slow

Drainage class: Moderately well drained

Available water capacity: About 7.8 inches

Depth to the top of the seasonal high water table: Greater than 6 feet

Flooding: None

Ponding: None

Other properties: Saline within a depth of 30 inches; sodic within a depth of 30 inches

Land capability classification, nonirrigated: 4s

Ecological site number and name: R080AY891OK, Eroded Slickspot PE 44-64

Typical profile:

Ap—0 to 8 inches; silt loam

Btkn1—8 to 44 inches; silty clay

Btkn2—44 to 80 inches; silty clay loam

Additional Components

Bethany soils: 8 percent of the map unit

Renfrow soils: 7 percent of the map unit

54—Slaughterville-Urban land complex, 1 to 5 percent slopes

Map Unit Setting

Major land resource area: 80A

Elevation: 500 to 2,000 feet

Mean annual precipitation: 22 to 40 inches

Mean annual air temperature: 57 to 64 degrees F

Frost-free period: 185 to 230 days

Major Component Description

Slaughterville

Extent: 50 percent of the map unit

Geomorphic setting: Dunes in dune fields on sandhills in valleys

Parent material: Loamy and/or sandy eolian deposits

Slope: 3 to 5 percent

Surface runoff class: Very low

Soil depth: Greater than 60 inches

Slowest permeability class of the soil to a depth of 60 inches or above a restrictive layer: Moderately rapid

Slowest permeability class within a depth of 80 inches: Moderately rapid

Drainage class: Well drained

Available water capacity: About 7.7 inches

Depth to the top of the seasonal high water table: Greater than 6 feet

Flooding: None

Ponding: None

Land capability classification, nonirrigated: 3e

Typical profile:

A—0 to 19 inches; fine sandy loam

Bw—19 to 51 inches; fine sandy loam

C1—51 to 71 inches; fine sandy loam

C2—71 to 80 inches; loamy fine sand

Urban land

Extent: 40 percent of the map unit

Geomorphic setting: Urban land

Parent material: Sandy mine spoil or earthy fill

Slope: 1 to 5 percent

Surface runoff class: Very high

Land capability classification, nonirrigated: 8

Additional Components

Derby soils: 4 percent of the map unit

Dougherty soils: 2 percent of the map unit

Konawa soils: 2 percent of the map unit

Teller soils: 2 percent of the map unit

55—Slaughterville-Urban land complex, 8 to 25 percent slopes

Map Unit Setting

Major land resource area: 80A

Elevation: 500 to 2,000 feet

Mean annual precipitation: 22 to 40 inches

Mean annual air temperature: 57 to 64 degrees F

Frost-free period: 185 to 230 days

Major Component Description

Slaughterville

Extent: 50 percent of the map unit

Geomorphic setting: Dunes in dune fields on sandhills in valleys

Parent material: Loamy and/or sandy eolian deposits

Slope: 15 to 25 percent

Surface runoff class: Medium

Soil depth: Greater than 60 inches

Slowest permeability class of the soil to a depth of 60 inches or above a restrictive layer: Moderately rapid

Slowest permeability class within a depth of 80 inches: Moderately rapid

Drainage class: Well drained

Available water capacity: About 7.6 inches

Depth to the top of the seasonal high water table: Greater than 6 feet

Flooding: None

Ponding: None

Land capability classification, nonirrigated: 7e

Typical profile:

A—0 to 11 inches; fine sandy loam

Bw—11 to 23 inches; fine sandy loam

C1—23 to 56 inches; fine sandy loam

C2—56 to 80 inches; loamy fine sand

Urban land

Extent: 45 percent of the map unit

Geomorphic setting: Urban land

Parent material: Sandy mine spoil or earthy fill

Slope: 8 to 15 percent

Surface runoff class: Very high

Land capability classification, nonirrigated: 8

Additional Components

Konawa soils: 3 percent of the map unit
Teller soils: 2 percent of the map unit

57—Teller-Urban land complex, 1 to 3 percent slopes

Map Unit Setting

Major land resource area: 80A
Elevation: 700 to 2,000 feet
Mean annual precipitation: 22 to 40 inches
Mean annual air temperature: 57 to 64 degrees F
Frost-free period: 185 to 230 days

Major Component Description

Teller

Extent: 45 percent of the map unit
Geomorphic setting: Stream terraces in valleys
Position on landform: Treads
Parent material: Loamy alluvium
Slope: 1 to 3 percent
Surface runoff class: Low
Soil depth: Greater than 60 inches
Slowest permeability class of the soil to a depth of 60 inches or above a restrictive layer: Moderate
Slowest permeability class within a depth of 80 inches: Moderate
Drainage class: Well drained
Available water capacity: About 9.9 inches
Depth to the top of the seasonal high water table: Greater than 6 feet
Flooding: None
Ponding: None
Land capability classification, nonirrigated: 2e
Typical profile:
A—0 to 11 inches; fine sandy loam
BA—11 to 19 inches; fine sandy loam
Bt1—19 to 54 inches; sandy clay loam
Bt2—54 to 63 inches; fine sandy loam
C—63 to 80 inches; very fine sandy loam

Urban land

Extent: 45 percent of the map unit
Geomorphic setting: Urban land
Parent material: Loamy mine spoil or earthy fill
Slope: 1 to 3 percent
Surface runoff class: Very high
Land capability classification, nonirrigated: 8

Additional Components

Norge soils: 5 percent of the map unit
Slaughterville soils: 5 percent of the map unit

58—Teller-Urban land complex, 3 to 8 percent slopes

Map Unit Setting

Major land resource area: 80A

Elevation: 700 to 2,000 feet
Mean annual precipitation: 22 to 40 inches
Mean annual air temperature: 57 to 64 degrees F
Frost-free period: 185 to 230 days

Major Component Description

Teller

Extent: 50 percent of the map unit
Geomorphic setting: Stream terraces in valleys
Position on landform: Treads
Parent material: Loamy alluvium
Slope: 5 to 8 percent
Surface runoff class: Medium
Soil depth: Greater than 60 inches
Slowest permeability class of the soil to a depth of 60 inches or above a restrictive layer: Moderate
Slowest permeability class within a depth of 80 inches: Moderate
Drainage class: Well drained
Available water capacity: About 9.9 inches
Depth to the top of the seasonal high water table: Greater than 6 feet
Flooding: None
Ponding: None
Land capability classification, nonirrigated: 4e
Typical profile:
A—0 to 11 inches; fine sandy loam
BA—11 to 19 inches; fine sandy loam
Bt1—19 to 50 inches; sandy clay loam
Bt2—50 to 63 inches; fine sandy loam
C—63 to 80 inches; very fine sandy loam

Urban land

Extent: 40 percent of the map unit
Geomorphic setting: Urban land
Parent material: Loamy mine spoil or earthy fill
Slope: 3 to 8 percent
Surface runoff class: Very high
Land capability classification, nonirrigated: 8

Additional Components

Norge soils: 5 percent of the map unit
Slaughterville soils: 5 percent of the map unit

59—Bethany-Urban land complex, 0 to 3 percent slopes

Map Unit Setting

Major land resource area: 80A
Elevation: 700 to 2,000 feet
Mean annual precipitation: 22 to 40 inches
Mean annual air temperature: 57 to 64 degrees F
Frost-free period: 185 to 230 days

Major Component Description

Bethany

Extent: 45 percent of the map unit
Geomorphic setting: Plains on paleoterraces on uplands

Position on landform: Treads

Parent material: Silty alluvium over clayey residuum weathered from shale

Slope: 1 to 3 percent

Surface runoff class: Medium

Soil depth: Greater than 60 inches

Slowest permeability class of the soil to a depth of 60 inches or above a restrictive layer: Slow

Slowest permeability class within a depth of 80 inches: Slow

Drainage class: Well drained

Available water capacity: About 10.6 inches

Depth to the top of the seasonal high water table: Greater than 6 feet

Flooding: None

Ponding: None

Land capability classification, nonirrigated: 2e

Typical profile:

A—0 to 13 inches; silt loam

BA—13 to 22 inches; silty clay loam

Bt—22 to 41 inches; silty clay loam

Btk—41 to 84 inches; silty clay

Urban land

Extent: 40 percent of the map unit

Geomorphic setting: Urban land

Parent material: Silty and clayey mine spoil or earthy fill

Slope: 0 to 3 percent

Surface runoff class: Very high

Land capability classification, nonirrigated: 8

Additional Components

Kirkland soils: 5 percent of the map unit

Pawhuska soils: 5 percent of the map unit

Vanoss soils: 5 percent of the map unit

60—Bethany silt loam, 0 to 1 percent slopes

Map Unit Setting

Major land resource area: 80A

Elevation: 700 to 1,500 feet

Mean annual precipitation: 26 to 40 inches

Mean annual air temperature: 57 to 64 degrees F

Frost-free period: 190 to 230 days

Major Component Description

Bethany

Extent: 85 percent of the map unit

Geomorphic setting: Plains on paleoterraces on uplands

Position on landform: Treads

Parent material: Silty alluvium over clayey residuum weathered from shale

Slope: 0 to 1 percent

Surface runoff class: Low

Soil depth: Greater than 60 inches

Slowest permeability class of the soil to a depth of 60 inches or above a restrictive layer: Moderately slow

Slowest permeability class within a depth of 80 inches: Slow

Drainage class: Well drained

Available water capacity: About 10.8 inches

Depth to the top of the seasonal high water table: Greater than 6 feet

Flooding: None

Ponding: None

Land capability classification, nonirrigated: 1

Ecological site number and name: R080AY056OK, Loamy Prairie PE 44-64

Typical profile:

Ap—0 to 13 inches; silt loam

BA—13 to 21 inches; silty clay loam

Bt1—21 to 30 inches; silty clay loam

Bt2—30 to 65 inches; silty clay

Bt3—65 to 84 inches; clay loam

Additional Components

Kirkland soils: 5 percent of the map unit

Pawhuska soils: 5 percent of the map unit

Vanoss soils: 5 percent of the map unit

61—Bethany silt loam, 1 to 3 percent slopes

Map Unit Setting

Major land resource area: 80A

Elevation: 700 to 1,500 feet

Mean annual precipitation: 26 to 40 inches

Mean annual air temperature: 57 to 64 degrees F

Frost-free period: 190 to 230 days

Major Component Description

Bethany

Extent: 85 percent of the map unit

Geomorphic setting: Plains on paleoterraces on uplands

Position on landform: Treads

Parent material: Silty alluvium over clayey residuum weathered from shale

Slope: 1 to 3 percent

Surface runoff class: Medium

Soil depth: Greater than 60 inches

Slowest permeability class of the soil to a depth of 60 inches or above a restrictive layer: Moderately slow

Slowest permeability class within a depth of 80 inches: Slow

Drainage class: Well drained

Available water capacity: About 10.7 inches

Depth to the top of the seasonal high water table: Greater than 6 feet

Flooding: None

Ponding: None

Land capability classification, nonirrigated: 2e

Ecological site number and name: R080AY056OK, Loamy Prairie PE 44-64

Typical profile:

Ap—0 to 12 inches; silt loam

BA—12 to 19 inches; silty clay loam

Bt1—19 to 29 inches; silty clay loam

Bt2—29 to 62 inches; silty clay

Bt3—62 to 80 inches; silty clay

Additional Components

Kirkland soils: 5 percent of the map unit

Renfrow soils: 5 percent of the map unit

Vanoss soils: 5 percent of the map unit

62—Renfrow silt loam, 1 to 3 percent slopes

Map Unit Setting

Major land resource area: 80A

Elevation: 700 to 1,500 feet

Mean annual precipitation: 26 to 40 inches

Mean annual air temperature: 57 to 64 degrees F

Frost-free period: 190 to 230 days

Major Component Description

Renfrow

Extent: 85 percent of the map unit

Geomorphic setting: Hillslopes on hills on uplands

Position on hillslope: Summits and shoulders

Parent material: Clayey residuum weathered from shale

Slope: 1 to 3 percent

Surface runoff class: Very high

Soil depth: 60 to 80 inches to bedrock (paralithic)

Slowest permeability class of the soil to a depth of 60 inches or above a restrictive layer: Very slow

Slowest permeability class within a depth of 80 inches: Impermeable

Drainage class: Well drained

Available water capacity: About 10.5 inches

Depth to the top of the seasonal high water table: Greater than 6 feet

Flooding: None

Ponding: None

Land capability classification, nonirrigated: 2e

Ecological site number and name: R080AY010OK, Claypan Prairie (North) PE 44-64

Typical profile:

Ap—0 to 11 inches; silt loam

BA—11 to 16 inches; silty clay loam

Btk1—16 to 33 inches; silty clay

Btk2—33 to 71 inches; silty clay

Cr—71 to 80 inches; bedrock

Additional Components

Grainola soils: 5 percent of the map unit

Huska soils: 3 percent of the map unit

Norge soils: 5 percent of the map unit

Grant soils: 2 percent of the map unit

63—Renfrow silt loam, 3 to 5 percent slopes

Map Unit Setting

Major land resource area: 80A

Elevation: 700 to 1,500 feet

Mean annual precipitation: 26 to 40 inches

Mean annual air temperature: 57 to 64 degrees F

Frost-free period: 190 to 230 days

Major Component Description

Renfrow

Extent: 80 percent of the map unit

Geomorphic setting: Hillslopes on hills on uplands

Position on hillslope: Shoulders and backslopes

Parent material: Clayey residuum weathered from shale

Slope: 3 to 5 percent

Surface runoff class: Very high

Soil depth: 60 to 80 inches to bedrock (paralithic)

Slowest permeability class of the soil to a depth of 60 inches or above a restrictive layer: Moderately slow

Slowest permeability class within a depth of 80 inches: Impermeable

Drainage class: Well drained

Available water capacity: About 10.4 inches

Depth to the top of the seasonal high water table: Greater than 6 feet

Flooding: None

Ponding: None

Land capability classification, nonirrigated: 3e

Ecological site number and name: R080AY010OK, Claypan Prairie (North) PE 44-64

Typical profile:

Ap—0 to 8 inches; silt loam

BA—8 to 13 inches; silty clay loam

Btk1—13 to 63 inches; silty clay

Btk2—63 to 72 inches; silty clay loam

Cr—72 to 80 inches; bedrock

Additional Components

Grainola soils: 10 percent of the map unit

Huska soils: 5 percent of the map unit

Norge soils: 3 percent of the map unit

Grant soils: 2 percent of the map unit

64—Renfrow silty clay loam, 3 to 5 percent slopes, eroded

Map Unit Setting

Major land resource area: 80A

Elevation: 700 to 1,500 feet

Mean annual precipitation: 26 to 40 inches

Mean annual air temperature: 57 to 64 degrees F

Frost-free period: 190 to 230 days

Major Component Description

Renfrow

Extent: 75 percent of the map unit

Geomorphic setting: Hillslopes on hills on uplands

Position on hillslope: Backslopes and shoulders

Parent material: Clayey residuum weathered from shale

Slope: 3 to 5 percent

Surface runoff class: Very high

Soil depth: 60 to 80 inches to bedrock (paralithic)

Slowest permeability class of the soil to a depth of 60 inches or above a restrictive layer: Very slow

Slowest permeability class within a depth of 80 inches: Impermeable

Drainage class: Well drained

Available water capacity: About 10.3 inches

Depth to the top of the seasonal high water table: Greater than 6 feet

Flooding: None

Ponding: None

Land capability classification, nonirrigated: 3e

Ecological site number and name: R080AY810OK, Eroded Claypan Prairie (North)

PE 44-64

Typical profile:

Ap—0 to 5 inches; silty clay loam

BA—5 to 9 inches; silty clay loam

Btk1—9 to 27 inches; silty clay

Btk2—27 to 73 inches; silty clay

Cr—73 to 80 inches; bedrock

Additional Components

Grainola soils: 10 percent of the map unit

Norge soils: 6 percent of the map unit

Huska soils: 5 percent of the map unit

Grant soils: 4 percent of the map unit

65—Renfrow-Huska complex, 3 to 5 percent slopes, eroded

Map Unit Setting

Major land resource area: 80A

Elevation: 700 to 1,500 feet

Mean annual precipitation: 26 to 40 inches

Mean annual air temperature: 57 to 64 degrees F

Frost-free period: 190 to 230 days

Major Component Description

Renfrow

Extent: 65 percent of the map unit

Geomorphic setting: Hillslopes on hills on uplands

Position on hillslope: Backslopes and shoulders

Parent material: Clayey residuum weathered from shale

Slope: 3 to 5 percent

Surface runoff class: Very high

Soil depth: 60 to 80 inches to bedrock (paralithic)

Slowest permeability class of the soil to a depth of 60 inches or above a restrictive layer: Very slow

Slowest permeability class within a depth of 80 inches: Impermeable

Drainage class: Well drained

Available water capacity: About 10.1 inches

Depth to the top of the seasonal high water table: Greater than 6 feet

Flooding: None

Ponding: None

Land capability classification, nonirrigated: 3e

Ecological site number and name: R080AY810OK, Eroded Claypan Prairie (North) PE 44-64

Typical profile:

A—0 to 5 inches; silty clay loam

Btk1—5 to 19 inches; silty clay
Btk2—19 to 73 inches; silty clay
Cr—73 to 80 inches; bedrock

Huska

Extent: 15 percent of the map unit
Geomorphic setting: Hillslopes on hills on uplands
Position on hillslope: Shoulders
Position on landform: Side slopes
Parent material: Saline, clayey residuum weathered from sandstone and shale
Slope: 3 to 5 percent
Surface runoff class: Very high
Soil depth: 40 to 60 inches to bedrock (paralithic)
Slowest permeability class of the soil to a depth of 60 inches or above a restrictive layer: Very slow
Slowest permeability class within a depth of 80 inches: Impermeable
Drainage class: Moderately well drained
Available water capacity: About 4.7 inches
Depth to the top of the seasonal high water table: Greater than 6 feet
Flooding: None
Ponding: None
Other properties: Saline within a depth of 30 inches; sodic within a depth of 30 inches
Land capability classification, nonirrigated: 6s
Ecological site number and name: R080AY891OK, Eroded Slickspot PE 44-64
Typical profile:
A—0 to 6 inches; silt loam
Bt—6 to 17 inches; silty clay
Btkn—17 to 53 inches; silty clay
Cr—53 to 77 inches; bedrock

Additional Components

Grainola soils: 10 percent of the map unit

Norge soils: 6 percent of the map unit

Grant soils: 4 percent of the map unit

66—Renfrow-Huska complex, 3 to 5 percent slopes

Map Unit Setting

Major land resource area: 80A
Elevation: 700 to 1,500 feet
Mean annual precipitation: 26 to 40 inches
Mean annual air temperature: 57 to 64 degrees F
Frost-free period: 190 to 230 days

Major Component Description

Renfrow

Extent: 60 percent of the map unit
Geomorphic setting: Hillslopes on hills on uplands
Position on hillslope: Backslopes and shoulders
Parent material: Clayey residuum weathered from shale
Slope: 3 to 5 percent
Surface runoff class: Very high
Soil depth: 60 to 80 inches to bedrock (paralithic)
Slowest permeability class of the soil to a depth of 60 inches or above a restrictive layer: Very slow

Supplement to the Soil Survey of Cleveland County, Oklahoma

Slowest permeability class within a depth of 80 inches: Impermeable

Drainage class: Well drained

Available water capacity: About 10.4 inches

Depth to the top of the seasonal high water table: Greater than 6 feet

Flooding: None

Ponding: None

Land capability classification, nonirrigated: 3e

Ecological site number and name: R080AY010OK, Claypan Prairie (North) PE 44-64

Typical profile:

A—0 to 8 inches; silt loam

BA—8 to 12 inches; silty clay loam

Btk1—12 to 29 inches; silty clay

Btk2—29 to 60 inches; silty clay

Cr—60 to 84 inches; bedrock

Huska

Extent: 15 percent of the map unit

Geomorphic setting: Hillslopes on hills on uplands

Position on hillslope: Shoulders

Position on landform: Side slopes

Parent material: Saline, clayey residuum weathered from sandstone and shale

Slope: 3 to 5 percent

Surface runoff class: Very high

Soil depth: 40 to 60 inches to bedrock (paralithic)

Slowest permeability class of the soil to a depth of 60 inches or above a restrictive layer: Very slow

Slowest permeability class within a depth of 80 inches: Impermeable

Drainage class: Moderately well drained

Available water capacity: About 3.6 inches

Depth to the top of the seasonal high water table: Greater than 6 feet

Flooding: None

Ponding: None

Other properties: Saline within a depth of 30 inches; sodic within a depth of 30 inches

Land capability classification, nonirrigated: 6s

Ecological site number and name: R080AY091OK, Slickspot PE 44-64

Typical profile:

A—0 to 3 inches; silt loam

Bt—3 to 24 inches; silty clay

Btkn1—24 to 38 inches; silty clay

Btkn2—38 to 42 inches; silty clay loam

Cr—42 to 45 inches; bedrock

Additional Components

Grainola soils: 10 percent of the map unit

Norge soils: 10 percent of the map unit

Grant soils: 5 percent of the map unit

67—Newalla fine sandy loam, 3 to 5 percent slopes

Map Unit Setting

Major land resource area: 84A

Elevation: 750 to 1,500 feet

Mean annual precipitation: 26 to 40 inches

Mean annual air temperature: 57 to 64 degrees F

Frost-free period: 190 to 230 days

Major Component Description

Newalla

Extent: 80 percent of the map unit

Geomorphic setting: Hillslopes on hills on uplands

Position on hillslope: Backslopes

Parent material: Loamy residuum weathered from sandstone over clayey residuum weathered from shale

Slope: 3 to 5 percent

Surface runoff class: Very high

Soil depth: 40 to 60 inches to bedrock (paralithic)

Slowest permeability class of the soil to a depth of 60 inches or above a restrictive layer: Very slow

Slowest permeability class within a depth of 80 inches: Very slow

Drainage class: Moderately well drained

Available water capacity: About 6.2 inches

Depth to the top of the seasonal high water table: Greater than 6 feet

Flooding: None

Ponding: None

Land capability classification, nonirrigated: 3e

Ecological site number and name: R084AY075OK, Sandy Savannah PE 44-64

Typical profile:

A—0 to 7 inches; fine sandy loam

Bt1—7 to 11 inches; sandy clay loam

2Bt2—11 to 36 inches; silty clay

2Bt3—36 to 42 inches; silty clay

2Cr—42 to 46 inches; bedrock

Additional Components

Grainola soils: 6 percent of the map unit

Harrah soils: 5 percent of the map unit

Stephenville soils: 4 percent of the map unit

Darsil soils: 3 percent of the map unit

Renfrow soils: 2 percent of the map unit

68—Newalla sandy clay loam, 3 to 8 percent slopes, gullied

Map Unit Setting

Major land resource area: 84A

Elevation: 700 to 1,500 feet

Mean annual precipitation: 26 to 40 inches

Mean annual air temperature: 57 to 64 degrees F

Frost-free period: 200 to 230 days

Major Component Description

Newalla

Extent: 85 percent of the map unit

Geomorphic setting: Hillslopes on hills on uplands

Position on hillslope: Backslopes

Parent material: Loamy residuum weathered from sandstone over clayey residuum weathered from shale

Slope: 3 to 8 percent

Surface runoff class: Very high

Soil depth: 40 to 60 inches to bedrock (paralithic)

Slowest permeability class of the soil to a depth of 60 inches or above a restrictive layer: Very slow

Slowest permeability class within a depth of 80 inches: Very slow

Drainage class: Moderately well drained

Available water capacity: About 6.8 inches

Depth to the top of the seasonal high water table: Greater than 6 feet

Flooding: None

Ponding: None

Land capability classification, nonirrigated: 6e

Ecological site number and name: R084AY876OK, Eroded Sandy Savannah PE 48-64

Typical profile:

A—0 to 5 inches; sandy clay loam

2Bt—5 to 39 inches; silty clay

2BC—39 to 47 inches; very gravelly silty clay

2Cr—47 to 60 inches; bedrock

Additional Components

Harrah soils: 4 percent of the map unit

Stephenville soils: 4 percent of the map unit

Darsil soils: 3 percent of the map unit

Grainola soils: 3 percent of the map unit

Ironmound soils: 1 percent of the map unit

69—Renfrow-Urban land-Huska complex, 1 to 5 percent slopes

Map Unit Setting

Major land resource area: 80A

Elevation: 700 to 2,000 feet

Mean annual precipitation: 22 to 40 inches

Mean annual air temperature: 57 to 64 degrees F

Frost-free period: 185 to 230 days

Major Component Description

Renfrow

Extent: 35 percent of the map unit

Geomorphic setting: Hillslopes on hills on uplands

Position on hillslope: Shoulders and backslopes

Parent material: Clayey residuum weathered from shale

Slope: 3 to 5 percent

Surface runoff class: Very high

Soil depth: 60 to 80 inches to bedrock (paralithic)

Slowest permeability class of the soil to a depth of 60 inches or above a restrictive layer: Very slow

Slowest permeability class within a depth of 80 inches: Impermeable

Drainage class: Well drained

Available water capacity: About 10.4 inches

Depth to the top of the seasonal high water table: Greater than 6 feet

Flooding: None

Ponding: None

Land capability classification, nonirrigated: 3e

Typical profile:

A—0 to 8 inches; silt loam
BA—8 to 12 inches; silty clay loam
Btk1—12 to 52 inches; silty clay
Btk2—52 to 62 inches; silty clay
Cr—62 to 84 inches; bedrock

Urban land

Extent: 35 percent of the map unit

Geomorphic setting: Urban land

Parent material: Clayey mine spoil or earthy fill derived from clayey shale

Slope: 1 to 5 percent

Surface runoff class: Very high

Land capability classification, nonirrigated: 8

Huska

Extent: 15 percent of the map unit

Geomorphic setting: Hillslopes on hills on uplands

Position on hillslope: Shoulders

Position on landform: Side slopes

Parent material: Saline, clayey residuum weathered from sandstone and shale

Slope: 3 to 5 percent

Surface runoff class: Very high

Soil depth: 40 to 60 inches to bedrock (paralithic)

Slowest permeability class of the soil to a depth of 60 inches or above a restrictive layer: Very slow

Slowest permeability class within a depth of 80 inches: Impermeable

Drainage class: Moderately well drained

Available water capacity: About 4.0 inches

Depth to the top of the seasonal high water table: Greater than 6 feet

Flooding: None

Ponding: None

Other properties: Saline within a depth of 30 inches; sodic within a depth of 30 inches

Land capability classification, nonirrigated: 6s

Typical profile:

A—0 to 4 inches; silt loam
Bt—4 to 19 inches; silty clay
Btkn1—19 to 40 inches; silty clay
Btkn2—40 to 46 inches; silty clay loam
Cr—46 to 50 inches; bedrock

Additional Components

Grainola soils: 4 percent of the map unit

Piedmont soils: 4 percent of the map unit

Grant soils: 3 percent of the map unit

Kirkland soils: 2 percent of the map unit

Pawhuska soils: 2 percent of the map unit

70—Slaughterville fine sandy loam, 1 to 3 percent slopes

Map Unit Setting

Major land resource area: 80A

Elevation: 500 to 2,200 feet

Mean annual precipitation: 22 to 40 inches

Mean annual air temperature: 57 to 64 degrees F

Frost-free period: 185 to 230 days

Major Component Description

Slaughterville

Extent: 80 percent of the map unit

Geomorphic setting: Dunes in dune fields on sandhills in valleys

Parent material: Loamy and/or sandy eolian deposits

Slope: 1 to 3 percent

Surface runoff class: Very low

Soil depth: Greater than 60 inches

Slowest permeability class of the soil to a depth of 60 inches or above a restrictive layer: Moderately rapid

Slowest permeability class within a depth of 80 inches: Moderately rapid

Drainage class: Well drained

Available water capacity: About 7.7 inches

Depth to the top of the seasonal high water table: Greater than 6 feet

Flooding: None

Ponding: None

Land capability classification, nonirrigated: 2e

Ecological site number and name: R080AY073OK, Sandy Prairie PE 44-64

Typical profile:

Ap—0 to 19 inches; fine sandy loam

Bw—19 to 42 inches; fine sandy loam

C1—42 to 60 inches; fine sandy loam

C2—60 to 80 inches; loamy fine sand

Additional Components

Konawa soils: 9 percent of the map unit

Teller soils: 9 percent of the map unit

Carwile soils: 2 percent of the map unit

71—Slaughterville fine sandy loam, 3 to 5 percent slopes

Map Unit Setting

Major land resource area: 80A

Elevation: 500 to 1,500 feet

Mean annual precipitation: 26 to 40 inches

Mean annual air temperature: 58 to 64 degrees F

Frost-free period: 190 to 230 days

Major Component Description

Slaughterville

Extent: 80 percent of the map unit

Geomorphic setting: Dunes in dune fields on sandhills in valleys

Parent material: Loamy and/or sandy eolian deposits

Slope: 3 to 5 percent

Surface runoff class: Very low

Soil depth: Greater than 60 inches

Slowest permeability class of the soil to a depth of 60 inches or above a restrictive layer: Moderately rapid

Slowest permeability class within a depth of 80 inches: Moderately rapid

Drainage class: Well drained

Available water capacity: About 7.7 inches

Depth to the top of the seasonal high water table: Greater than 6 feet

Flooding: None

Ponding: None

Land capability classification, nonirrigated: 3e

Ecological site number and name: R080AY073OK, Sandy Prairie PE 44-64

Typical profile:

Ap—0 to 18 inches; fine sandy loam

Bw—18 to 30 inches; fine sandy loam

C1—30 to 58 inches; fine sandy loam

C2—58 to 76 inches; loamy fine sand

Additional Components

Konawa soils: 10 percent of the map unit

Teller soils: 10 percent of the map unit

72—Slaughterville fine sandy loam, 5 to 8 percent slopes, loamy substratum

Map Unit Setting

Major land resource area: 80A

Elevation: 500 to 1,500 feet

Mean annual precipitation: 26 to 40 inches

Mean annual air temperature: 58 to 64 degrees F

Frost-free period: 200 to 230 days

Major Component Description

Slaughterville

Extent: 80 percent of the map unit

Geomorphic setting: Dunes in dune fields on sandhills in valleys

Parent material: Loamy and/or sandy eolian deposits

Slope: 5 to 8 percent

Surface runoff class: Low

Soil depth: Greater than 60 inches

Slowest permeability class of the soil to a depth of 60 inches or above a restrictive layer: Moderately rapid

Slowest permeability class within a depth of 80 inches: Moderate

Drainage class: Well drained

Available water capacity: About 8.4 inches

Depth to the top of the seasonal high water table: Greater than 6 feet

Flooding: None

Ponding: None

Land capability classification, nonirrigated: 4e

Ecological site number and name: R080AY073OK, Sandy Prairie PE 44-64

Typical profile:

Ap—0 to 11 inches; fine sandy loam

Bw—11 to 26 inches; fine sandy loam

C—26 to 45 inches; fine sandy loam

Akb—45 to 74 inches; silty clay loam

Additional Components

Konawa soils: 10 percent of the map unit

Teller soils: 10 percent of the map unit

73—*Slaughterville fine sandy loam, 8 to 25 percent slopes*

Map Unit Setting

Major land resource area: 80A

Elevation: 500 to 1,500 feet

Mean annual precipitation: 26 to 40 inches

Mean annual air temperature: 58 to 64 degrees F

Frost-free period: 190 to 230 days

Major Component Description

Slaughterville

Extent: 75 percent of the map unit

Geomorphic setting: Dunes in dune fields on sandhills in valleys

Parent material: Loamy and/or sandy eolian deposits

Slope: 8 to 25 percent

Surface runoff class: Low

Soil depth: Greater than 60 inches

Slowest permeability class of the soil to a depth of 60 inches or above a restrictive layer: Moderately rapid

Slowest permeability class within a depth of 80 inches: Moderately rapid

Drainage class: Well drained

Available water capacity: About 7.7 inches

Depth to the top of the seasonal high water table: Greater than 6 feet

Flooding: None

Ponding: None

Land capability classification, nonirrigated: 7e

Ecological site number and name: R080AY073OK, Sandy Prairie PE 44-64

Typical profile:

A—0 to 11 inches; fine sandy loam

Bw—11 to 25 inches; fine sandy loam

C1—25 to 60 inches; fine sandy loam

C2—60 to 72 inches; loamy fine sand

Additional Components

Konawa soils: 10 percent of the map unit

Teller soils: 10 percent of the map unit

Derby soils: 5 percent of the map unit

74—*Vanoss-Urban land-Norge complex, 0 to 3 percent slopes*

Map Unit Setting

Major land resource area: 80A

Elevation: 700 to 2,000 feet

Mean annual precipitation: 22 to 40 inches

Mean annual air temperature: 57 to 64 degrees F

Frost-free period: 185 to 230 days

Major Component Description

Vanoss

Extent: 40 percent of the map unit

Geomorphic setting: Paleoterraces in valleys

Supplement to the Soil Survey of Cleveland County, Oklahoma

Position on landform: Treads

Parent material: Loamy alluvium

Slope: 1 to 3 percent

Surface runoff class: Low

Soil depth: Greater than 60 inches

Slowest permeability class of the soil to a depth of 60 inches or above a restrictive layer: Moderate

Slowest permeability class within a depth of 80 inches: Moderate

Drainage class: Well drained

Available water capacity: About 11.4 inches

Depth to the top of the seasonal high water table: Greater than 6 feet

Flooding: None

Ponding: None

Land capability classification, nonirrigated: 2e

Typical profile:

A—0 to 12 inches; silt loam

BA—12 to 21 inches; silt loam

Bt—21 to 56 inches; silty clay loam

C—56 to 70 inches; loam

Urban land

Extent: 40 percent of the map unit

Geomorphic setting: Urban land

Parent material: Loamy mine spoil or earthy fill

Slope: 0 to 3 percent

Surface runoff class: Very high

Land capability classification, nonirrigated: 8

Norge

Extent: 15 percent of the map unit

Geomorphic setting: Paleoterraces on uplands

Position on landform: Treads

Parent material: Loamy alluvium

Slope: 1 to 3 percent

Surface runoff class: Medium

Soil depth: Greater than 60 inches

Slowest permeability class of the soil to a depth of 60 inches or above a restrictive layer: Moderately slow

Slowest permeability class within a depth of 80 inches: Moderately slow

Drainage class: Well drained

Available water capacity: About 11.4 inches

Depth to the top of the seasonal high water table: Greater than 6 feet

Flooding: None

Ponding: None

Land capability classification, nonirrigated: 2e

Typical profile:

A—0 to 10 inches; silt loam

BA—10 to 16 inches; silty clay loam

Bt1—16 to 56 inches; silty clay loam

Bt2—56 to 80 inches; silty clay loam

Additional Components

Bethany soils: 3 percent of the map unit

Kirkland soils: 2 percent of the map unit

75—Vanoss silt loam, 0 to 1 percent slopes

Map Unit Setting

Major land resource area: 80A

Elevation: 700 to 2,200 feet

Mean annual precipitation: 22 to 40 inches

Mean annual air temperature: 57 to 64 degrees F

Frost-free period: 185 to 230 days

Major Component Description

Vanoss

Extent: 85 percent of the map unit

Geomorphic setting: Paleoterraces in valleys

Position on landform: Treads

Parent material: Loamy alluvium

Slope: 0 to 1 percent

Surface runoff class: Negligible

Soil depth: Greater than 60 inches

Slowest permeability class of the soil to a depth of 60 inches or above a restrictive layer: Moderate

Slowest permeability class within a depth of 80 inches: Moderate

Drainage class: Well drained

Available water capacity: About 11.5 inches

Depth to the top of the seasonal high water table: Greater than 6 feet

Flooding: None

Ponding: None

Land capability classification, nonirrigated: 1

Ecological site number and name: R080AY056OK, Loamy Prairie PE 44-64

Typical profile:

Ap—0 to 11 inches; silt loam

BA—11 to 19 inches; silt loam

Bt—19 to 53 inches; silty clay loam

C—53 to 70 inches; loam

Ab—70 to 80 inches; sandy clay loam

Additional Components

Bethany soils: 7 percent of the map unit

Slaughterville soils: 4 percent of the map unit

Carwile soils: 2 percent of the map unit

Minco soils: 2 percent of the map unit

76—Vanoss silt loam, 1 to 3 percent slopes

Map Unit Setting

Major land resource area: 80A

Elevation: 700 to 1,500 feet

Mean annual precipitation: 26 to 40 inches

Mean annual air temperature: 57 to 64 degrees F

Frost-free period: 190 to 230 days

Major Component Description

Vanoss

Extent: 85 percent of the map unit

Geomorphic setting: Paleoterraces in valleys

Position on landform: Treads

Parent material: Loamy alluvium

Slope: 1 to 3 percent

Surface runoff class: Low

Soil depth: Greater than 60 inches

Slowest permeability class of the soil to a depth of 60 inches or above a restrictive layer: Moderate

Slowest permeability class within a depth of 80 inches: Moderate

Drainage class: Well drained

Available water capacity: About 11.5 inches

Depth to the top of the seasonal high water table: Greater than 6 feet

Flooding: None

Ponding: None

Land capability classification, nonirrigated: 2e

Ecological site number and name: R080AY056OK, Loamy Prairie PE 44-64

Typical profile:

Ap—0 to 19 inches; silt loam

BA—19 to 27 inches; silt loam

Bt1—27 to 43 inches; silty clay loam

Bt2—43 to 51 inches; silty clay loam

C—51 to 80 inches; silt loam

Additional Components

Bethany soils: 7 percent of the map unit

Slaughterville soils: 6 percent of the map unit

Minco soils: 2 percent of the map unit

77—Teller fine sandy loam, 1 to 3 percent slopes

Map Unit Setting

Major land resource area: 80A

Elevation: 700 to 1,300 feet

Mean annual precipitation: 26 to 40 inches

Mean annual air temperature: 57 to 64 degrees F

Frost-free period: 190 to 230 days

Major Component Description

Teller

Extent: 85 percent of the map unit

Geomorphic setting: Stream terraces in valleys

Position on landform: Treads

Parent material: Loamy alluvium

Slope: 1 to 3 percent

Surface runoff class: Low

Soil depth: Greater than 60 inches

Slowest permeability class of the soil to a depth of 60 inches or above a restrictive layer: Moderate

Slowest permeability class within a depth of 80 inches: Moderate

Drainage class: Well drained

Available water capacity: About 9.9 inches

Depth to the top of the seasonal high water table: Greater than 6 feet

Flooding: None

Ponding: None

Land capability classification, nonirrigated: 2e

Ecological site number and name: R080AY073OK, Sandy Prairie PE 44-64

Typical profile:

- Ap—0 to 13 inches; fine sandy loam
- BA—13 to 19 inches; fine sandy loam
- Bt1—19 to 37 inches; sandy clay loam
- Bt2—37 to 60 inches; fine sandy loam
- Btb—60 to 84 inches; silty clay loam

Additional Components

Slaughterville soils: 6 percent of the map unit

Vanoss soils: 5 percent of the map unit

Norge soils: 4 percent of the map unit

78—Teller fine sandy loam, 3 to 5 percent slopes

Map Unit Setting

Major land resource area: 80A

Elevation: 800 to 1,300 feet

Mean annual precipitation: 26 to 40 inches

Mean annual air temperature: 57 to 64 degrees F

Frost-free period: 200 to 230 days

Major Component Description

Teller

Extent: 85 percent of the map unit

Geomorphic setting: Stream terraces in valleys

Position on landform: Treads

Parent material: Loamy alluvium

Slope: 3 to 5 percent

Surface runoff class: Very low

Soil depth: Greater than 60 inches

Slowest permeability class of the soil to a depth of 60 inches or above a restrictive layer: Moderate

Slowest permeability class within a depth of 80 inches: Moderate

Drainage class: Well drained

Available water capacity: About 9.8 inches

Depth to the top of the seasonal high water table: Greater than 6 feet

Flooding: None

Ponding: None

Land capability classification, nonirrigated: 3e

Ecological site number and name: R080AY073OK, Sandy Prairie PE 44-64

Typical profile:

- Ap—0 to 13 inches; fine sandy loam
- BA—13 to 21 inches; fine sandy loam
- Bt1—21 to 42 inches; sandy clay loam
- Bt2—42 to 60 inches; fine sandy loam
- C—60 to 80 inches; very fine sandy loam

Additional Components

Norge soils: 10 percent of the map unit

Harrah soils: 5 percent of the map unit

79—Teller fine sandy loam, 5 to 8 percent slopes, eroded

Map Unit Setting

Major land resource area: 80A

Elevation: 800 to 1,300 feet

Mean annual precipitation: 26 to 40 inches

Mean annual air temperature: 57 to 64 degrees F

Frost-free period: 200 to 230 days

Major Component Description

Teller

Extent: 85 percent of the map unit

Geomorphic setting: Stream terraces in valleys

Position on landform: Treads

Parent material: Loamy alluvium

Slope: 5 to 8 percent

Surface runoff class: Medium

Soil depth: Greater than 60 inches

Slowest permeability class of the soil to a depth of 60 inches or above a restrictive layer: Moderate

Slowest permeability class within a depth of 80 inches: Moderate

Drainage class: Well drained

Available water capacity: About 9.9 inches

Depth to the top of the seasonal high water table: Greater than 6 feet

Flooding: None

Ponding: None

Land capability classification, nonirrigated: 4e

Ecological site number and name: R080AY856OK, Eroded Loamy Prairie PE 44-64

Typical profile:

Ap—0 to 8 inches; fine sandy loam

BA—8 to 14 inches; fine sandy loam

Bt1—14 to 36 inches; sandy clay loam

Bt2—36 to 60 inches; fine sandy loam

C—60 to 80 inches; fine sandy loam

Additional Components

Norge soils: 10 percent of the map unit

Harrah soils: 5 percent of the map unit

80—Teller fine sandy loam, 5 to 8 percent slopes

Map Unit Setting

Major land resource area: 80A

Elevation: 800 to 1,300 feet

Mean annual precipitation: 26 to 40 inches

Mean annual air temperature: 57 to 64 degrees F

Frost-free period: 200 to 230 days

Major Component Description

Teller

Extent: 90 percent of the map unit

Geomorphic setting: Stream terraces in valleys

Position on landform: Treads

Parent material: Loamy alluvium

Supplement to the Soil Survey of Cleveland County, Oklahoma

Slope: 5 to 8 percent

Surface runoff class: Medium

Soil depth: Greater than 60 inches

Slowest permeability class of the soil to a depth of 60 inches or above a restrictive layer: Moderate

Slowest permeability class within a depth of 80 inches: Moderate

Drainage class: Well drained

Available water capacity: About 9.9 inches

Depth to the top of the seasonal high water table: Greater than 6 feet

Flooding: None

Ponding: None

Land capability classification, nonirrigated: 4e

Ecological site number and name: R080AY073OK, Sandy Prairie PE 44-64

Typical profile:

Ap—0 to 10 inches; fine sandy loam

BA—10 to 16 inches; fine sandy loam

Bt—16 to 38 inches; sandy clay loam

C—38 to 80 inches; fine sandy loam

Additional Components

Harrah soils: 5 percent of the map unit

Norge soils: 5 percent of the map unit

81—Norge silt loam, 1 to 3 percent slopes

Map Unit Setting

Major land resource area: 80A

Elevation: 700 to 1,500 feet

Mean annual precipitation: 26 to 40 inches

Mean annual air temperature: 57 to 64 degrees F

Frost-free period: 190 to 230 days

Major Component Description

Norge

Extent: 85 percent of the map unit

Geomorphic setting: Paleoterraces on uplands

Position on landform: Treads

Parent material: Loamy alluvium

Slope: 1 to 3 percent

Surface runoff class: Medium

Soil depth: Greater than 60 inches

Slowest permeability class of the soil to a depth of 60 inches or above a restrictive layer: Moderately slow

Slowest permeability class within a depth of 80 inches: Moderately slow

Drainage class: Well drained

Available water capacity: About 11.4 inches

Depth to the top of the seasonal high water table: Greater than 6 feet

Flooding: None

Ponding: None

Land capability classification, nonirrigated: 2e

Ecological site number and name: R080AY056OK, Loamy Prairie PE 44-64

Typical profile:

Ap—0 to 10 inches; silt loam

BA—10 to 17 inches; silty clay loam

Bt1—17 to 56 inches; silty clay loam
Bt2—56 to 80 inches; silty clay

Additional Components

Grant soils: 5 percent of the map unit

Pawhuska soils: 5 percent of the map unit

Teller soils: 5 percent of the map unit

82—Norge silt loam, 3 to 5 percent slopes

Map Unit Setting

Major land resource area: 80A

Elevation: 700 to 1,500 feet

Mean annual precipitation: 26 to 40 inches

Mean annual air temperature: 57 to 64 degrees F

Frost-free period: 200 to 230 days

Major Component Description

Norge

Extent: 85 percent of the map unit

Geomorphic setting: Paleoterraces on uplands

Position on landform: Treads

Parent material: Loamy alluvium

Slope: 3 to 5 percent

Surface runoff class: Medium

Soil depth: Greater than 60 inches

Slowest permeability class of the soil to a depth of 60 inches or above a restrictive layer: Moderately slow

Slowest permeability class within a depth of 80 inches: Moderately slow

Drainage class: Well drained

Available water capacity: About 11.4 inches

Depth to the top of the seasonal high water table: Greater than 6 feet

Flooding: None

Ponding: None

Land capability classification, nonirrigated: 3e

Ecological site number and name: R080AY056OK, Loamy Prairie PE 44-64

Typical profile:

Ap—0 to 12 inches; silt loam

BA—12 to 18 inches; silty clay loam

Bt1—18 to 58 inches; silty clay loam

Bt2—58 to 80 inches; silty clay

Additional Components

Grant soils: 5 percent of the map unit

Pawhuska soils: 5 percent of the map unit

Teller soils: 5 percent of the map unit

83—Norge silt loam, 5 to 8 percent slopes, eroded

Map Unit Setting

Major land resource area: 80A

Elevation: 700 to 1,500 feet

Mean annual precipitation: 26 to 40 inches

Mean annual air temperature: 57 to 64 degrees F

Frost-free period: 190 to 230 days

Major Component Description

Norge

Extent: 85 percent of the map unit

Geomorphic setting: Paleoterraces on uplands

Position on landform: Treads

Parent material: Loamy alluvium

Slope: 5 to 8 percent

Surface runoff class: High

Soil depth: Greater than 60 inches

Slowest permeability class of the soil to a depth of 60 inches or above a restrictive layer: Moderately slow

Slowest permeability class within a depth of 80 inches: Moderately slow

Drainage class: Well drained

Available water capacity: About 11.3 inches

Depth to the top of the seasonal high water table: Greater than 6 feet

Flooding: None

Ponding: None

Land capability classification, nonirrigated: 4e

Ecological site number and name: R080AY856OK, Eroded Loamy Prairie PE 44-64

Typical profile:

Ap—0 to 7 inches; silt loam

BA—7 to 11 inches; silty clay loam

Bt1—11 to 72 inches; silty clay loam

Bt2—72 to 80 inches; silty clay

Additional Components

Pawhuska soils: 5 percent of the map unit

Teller soils: 5 percent of the map unit

Grant soils: 3 percent of the map unit

Renfrow soils: 2 percent of the map unit

84—Grant-Huska complex, 1 to 5 percent slopes

Map Unit Setting

Major land resource area: 80A

Elevation: 700 to 1,500 feet

Mean annual precipitation: 26 to 40 inches

Mean annual air temperature: 57 to 64 degrees F

Frost-free period: 190 to 230 days

Major Component Description

Grant

Extent: 60 percent of the map unit

Geomorphic setting: Paleoterraces on uplands

Position on landform: Treads

Parent material: Silty residuum weathered from sandstone and shale

Slope: 3 to 5 percent

Surface runoff class: Low

Soil depth: 40 to 60 inches to bedrock (paralithic)

Slowest permeability class of the soil to a depth of 60 inches or above a restrictive layer: Moderate

Supplement to the Soil Survey of Cleveland County, Oklahoma

Slowest permeability class within a depth of 80 inches: Very slow

Drainage class: Well drained

Available water capacity: About 8.9 inches

Depth to the top of the seasonal high water table: Greater than 6 feet

Flooding: None

Ponding: None

Land capability classification, nonirrigated: 3e

Ecological site number and name: R080AY056OK, Loamy Prairie PE 44-64

Typical profile:

A—0 to 9 inches; silt loam

AB—9 to 15 inches; silt loam

Bt1—15 to 32 inches; silty clay loam

Bt2—32 to 50 inches; silty clay loam

Cr—50 to 60 inches; bedrock

Huska

Extent: 15 percent of the map unit

Geomorphic setting: Hillslopes on hills on uplands

Position on hillslope: Shoulders

Position on landform: Side slopes

Parent material: Saline, clayey residuum weathered from sandstone and shale

Slope: 1 to 5 percent

Surface runoff class: Very high

Soil depth: 40 to 60 inches to bedrock (paralithic)

Slowest permeability class of the soil to a depth of 60 inches or above a restrictive layer: Very slow

Slowest permeability class within a depth of 80 inches: Impermeable

Drainage class: Moderately well drained

Available water capacity: About 4.7 inches

Depth to the top of the seasonal high water table: Greater than 6 feet

Flooding: None

Ponding: None

Other properties: Saline within a depth of 30 inches; sodic within a depth of 30 inches

Land capability classification, nonirrigated: 6s

Ecological site number and name: R080AY091OK, Slickspot PE 44-64

Typical profile:

A—0 to 7 inches; silt loam

Bt—7 to 16 inches; silty clay

Btkn—16 to 52 inches; silty clay

Cr—52 to 60 inches; bedrock

Additional Components

Kingfisher soils: 10 percent of the map unit

Norge soils: 5 percent of the map unit

Renfrow soils: 5 percent of the map unit

Teller soils: 5 percent of the map unit

85—Norge silt loam, 5 to 8 percent slopes

Map Unit Setting

Major land resource area: 80A

Elevation: 700 to 1,500 feet

Mean annual precipitation: 26 to 40 inches

Mean annual air temperature: 57 to 64 degrees F
Frost-free period: 190 to 230 days

Major Component Description

Norge

Extent: 85 percent of the map unit
Geomorphic setting: Paleoterraces on uplands
Position on landform: Treads
Parent material: Loamy alluvium
Slope: 5 to 8 percent
Surface runoff class: High
Soil depth: Greater than 60 inches
Slowest permeability class of the soil to a depth of 60 inches or above a restrictive layer: Moderately slow
Slowest permeability class within a depth of 80 inches: Moderately slow
Drainage class: Well drained
Available water capacity: About 11.4 inches
Depth to the top of the seasonal high water table: Greater than 6 feet
Flooding: None
Ponding: None
Land capability classification, nonirrigated: 4e
Ecological site number and name: R080AY056OK, Loamy Prairie PE 44-64
Typical profile:
A—0 to 9 inches; silt loam
BA—9 to 14 inches; silty clay loam
Bt1—14 to 74 inches; silty clay loam
Bt2—74 to 80 inches; silty clay loam

Additional Components

Grant soils: 5 percent of the map unit
Teller soils: 5 percent of the map unit
Pawhuska soils: 3 percent of the map unit
Renfrow soils: 2 percent of the map unit

86—Norge-Urban land complex, 3 to 8 percent slopes

Map Unit Setting

Major land resource area: 80A
Elevation: 700 to 2,000 feet
Mean annual precipitation: 22 to 40 inches
Mean annual air temperature: 57 to 64 degrees F
Frost-free period: 185 to 230 days

Major Component Description

Norge

Extent: 45 percent of the map unit
Geomorphic setting: Paleoterraces on uplands
Position on landform: Treads
Parent material: Loamy alluvium
Slope: 5 to 8 percent
Surface runoff class: High
Soil depth: Greater than 60 inches
Slowest permeability class of the soil to a depth of 60 inches or above a restrictive layer: Moderately slow

Slowest permeability class within a depth of 80 inches: Moderately slow
Drainage class: Well drained

Available water capacity: About 11.4 inches

Depth to the top of the seasonal high water table: Greater than 6 feet

Flooding: None

Ponding: None

Land capability classification, nonirrigated: 4e

Typical profile:

A—0 to 10 inches; silt loam

BA—10 to 16 inches; silty clay loam

Bt1—16 to 55 inches; silty clay loam

Bt2—55 to 80 inches; silty clay loam

Urban land

Extent: 45 percent of the map unit

Geomorphic setting: Urban land

Parent material: Loamy mine spoil or earthy fill

Slope: 3 to 8 percent

Surface runoff class: Very high

Land capability classification, nonirrigated: 8

Additional Components

Teller soils: 5 percent of the map unit

Renfrow soils: 3 percent of the map unit

Pawhuska soils: 2 percent of the map unit

88—Grant-Urban land-Huska complex, 1 to 5 percent slopes

Map Unit Setting

Major land resource area: 80A

Elevation: 700 to 2,000 feet

Mean annual precipitation: 22 to 40 inches

Mean annual air temperature: 57 to 64 degrees F

Frost-free period: 185 to 230 days

Major Component Description

Grant

Extent: 40 percent of the map unit

Geomorphic setting: Paleoterraces on uplands

Position on landform: Treads

Parent material: Silty residuum weathered from sandstone and shale

Slope: 3 to 5 percent

Surface runoff class: Low

Soil depth: 40 to 60 inches to bedrock (paralithic)

Slowest permeability class of the soil to a depth of 60 inches or above a restrictive layer: Moderate

Slowest permeability class within a depth of 80 inches: Very slow

Drainage class: Well drained

Available water capacity: About 7.7 inches

Depth to the top of the seasonal high water table: Greater than 6 feet

Flooding: None

Ponding: None

Land capability classification, nonirrigated: 3e

Typical profile:

A—0 to 8 inches; silt loam
AB—8 to 12 inches; silt loam
Bt1—12 to 37 inches; silty clay loam
Bt2—37 to 43 inches; silty clay loam
Cr—43 to 60 inches; bedrock

Urban land

Extent: 35 percent of the map unit

Geomorphic setting: Urban land

Parent material: Silty mine spoil or earthy fill derived from sandstone and shale

Slope: 1 to 5 percent

Surface runoff class: Very high

Land capability classification, nonirrigated: 8

Huska

Extent: 15 percent of the map unit

Geomorphic setting: Hillslopes on hills on uplands

Position on hillslope: Shoulders

Position on landform: Side slopes

Parent material: Saline, clayey residuum weathered from sandstone and shale

Slope: 3 to 5 percent

Surface runoff class: Very high

Soil depth: 40 to 60 inches to bedrock (paralithic)

Slowest permeability class of the soil to a depth of 60 inches or above a restrictive layer: Very slow

Slowest permeability class within a depth of 80 inches: Impermeable

Drainage class: Moderately well drained

Available water capacity: About 4.2 inches

Depth to the top of the seasonal high water table: Greater than 6 feet

Flooding: None

Ponding: None

Other properties: Saline within a depth of 30 inches; sodic within a depth of 30 inches

Land capability classification, nonirrigated: 6s

Typical profile:

A—0 to 5 inches; silt loam
Bt—5 to 14 inches; silty clay
Btkn—14 to 48 inches; silty clay
Cr—48 to 68 inches; bedrock

Additional Components

Kingfisher soils: 5 percent of the map unit

Renfrow soils: 3 percent of the map unit

Norge soils: 2 percent of the map unit

90—Keokuk very fine sandy loam, 0 to 1 percent slopes, rarely flooded

Map Unit Setting

Major land resource area: 80A

Elevation: 700 to 2,200 feet

Mean annual precipitation: 22 to 40 inches

Mean annual air temperature: 57 to 64 degrees F

Frost-free period: 185 to 230 days

Major Component Description

Keokuk

Extent: 85 percent of the map unit

Geomorphic setting: Flood plains in river valleys

Parent material: Loamy and sandy alluvium

Slope: 0 to 1 percent

Surface runoff class: Negligible

Soil depth: Greater than 60 inches

Slowest permeability class of the soil to a depth of 60 inches or above a restrictive layer: Moderate

Slowest permeability class within a depth of 80 inches: Moderate

Drainage class: Well drained

Available water capacity: About 9.7 inches

Depth to the top of the seasonal high water table: Greater than 6 feet

Flooding: Rare

Ponding: None

Land capability classification, nonirrigated: 1

Ecological site number and name: R080AY050OK, Loamy Bottomland PE 44-64

Typical profile:

Ap—0 to 12 inches; very fine sandy loam

Bw—12 to 26 inches; very fine sandy loam

C—26 to 84 inches; stratified loamy very fine sand to silt loam

Additional Components

Asher soils: 5 percent of the map unit

Canadian soils: 3 percent of the map unit

Gracemont soils: 3 percent of the map unit

Goodnight soils: 2 percent of the map unit

Lebron soils: 2 percent of the map unit

91—Gracemont silt loam, 0 to 1 percent slopes, occasionally flooded

Map Unit Setting

Major land resource area: 80A

Elevation: 700 to 2,200 feet

Mean annual precipitation: 22 to 40 inches

Mean annual air temperature: 57 to 64 degrees F

Frost-free period: 185 to 230 days

Major Component Description

Gracemont

Extent: 85 percent of the map unit

Geomorphic setting: Flood plains in river valleys

Parent material: Calcareous, sandy and/or loamy alluvium

Slope: 0 to 1 percent

Surface runoff class: High

Soil depth: Greater than 60 inches

Slowest permeability class of the soil to a depth of 60 inches or above a restrictive layer: Moderate

Slowest permeability class within a depth of 80 inches: Moderate

Drainage class: Somewhat poorly drained

Available water capacity: About 8.4 inches

Depth to the top of the seasonal high water table: 0.5 to 3.5 feet

Flooding: Occasional

Ponding: None

Land capability classification, nonirrigated: 3w

Ecological site number and name: R080AY095OK, Subirrigated PE 44-64

Typical profile:

Ap—0 to 15 inches; silt loam

C1—15 to 36 inches; very fine sandy loam

C2—36 to 80 inches; fine sand

Additional Components

Gaddy soils: 7 percent of the map unit

Gracemore soils: 5 percent of the map unit

Lomill soils: 3 percent of the map unit

92—Port fine sandy loam, 0 to 1 percent slopes, occasionally flooded

Map Unit Setting

Major land resource area: 80A

Elevation: 700 to 1,500 feet

Mean annual precipitation: 26 to 40 inches

Mean annual air temperature: 57 to 64 degrees F

Frost-free period: 185 to 240 days

Major Component Description

Port

Extent: 85 percent of the map unit

Geomorphic setting: Flood plains in valleys

Parent material: Calcareous, loamy alluvium

Slope: 0 to 1 percent

Surface runoff class: Negligible

Soil depth: Greater than 60 inches

Slowest permeability class of the soil to a depth of 60 inches or above a restrictive layer: Moderate

Slowest permeability class within a depth of 80 inches: Moderate

Drainage class: Well drained

Available water capacity: About 11.1 inches

Depth to the top of the seasonal high water table: Greater than 6 feet

Flooding: Occasional

Ponding: None

Land capability classification, nonirrigated: 2w

Ecological site number and name: R080AY050OK, Loamy Bottomland PE 44-64

Typical profile:

Ap—0 to 19 inches; fine sandy loam

Bw—19 to 65 inches; silt loam

Ck—65 to 80 inches; silty clay loam

Additional Components

Easpur soils: 8 percent of the map unit

Pulaski soils: 5 percent of the map unit

Lebron soils: 2 percent of the map unit

93—Port silt loam, 0 to 1 percent slopes, occasionally flooded

Map Unit Setting

Major land resource area: 80A

Elevation: 700 to 1,500 feet

Mean annual precipitation: 26 to 40 inches

Mean annual air temperature: 57 to 64 degrees F

Frost-free period: 185 to 240 days

Major Component Description

Port

Extent: 85 percent of the map unit

Geomorphic setting: Flood plains in valleys

Parent material: Calcareous, loamy alluvium

Slope: 0 to 1 percent

Surface runoff class: Negligible

Soil depth: Greater than 60 inches

Slowest permeability class of the soil to a depth of 60 inches or above a restrictive layer: Moderate

Slowest permeability class within a depth of 80 inches: Moderate

Drainage class: Well drained

Available water capacity: About 11.8 inches

Depth to the top of the seasonal high water table: Greater than 6 feet

Flooding: Occasional

Ponding: None

Land capability classification, nonirrigated: 2w

Ecological site number and name: R080AY050OK, Loamy Bottomland PE 44-64

Typical profile:

Ap—0 to 23 inches; silt loam

Bw—23 to 65 inches; silty clay loam

Ck—65 to 80 inches; silty clay loam

Additional Components

Easpur soils: 8 percent of the map unit

Pulaski soils: 5 percent of the map unit

Lebron soils: 2 percent of the map unit

94—Port silt loam, 0 to 1 percent slopes, frequently flooded

Map Unit Setting

Major land resource area: 80A

Elevation: 700 to 1,500 feet

Mean annual precipitation: 26 to 40 inches

Mean annual air temperature: 57 to 64 degrees F

Frost-free period: 185 to 240 days

Major Component Description

Port

Extent: 75 percent of the map unit

Geomorphic setting: Flood plains in valleys

Parent material: Calcareous, loamy alluvium

Slope: 0 to 1 percent

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Surface runoff class: Negligible

Soil depth: Greater than 60 inches

Slowest permeability class of the soil to a depth of 60 inches or above a restrictive layer: Moderate

Slowest permeability class within a depth of 80 inches: Moderate

Drainage class: Well drained

Available water capacity: About 11.8 inches

Depth to the top of the seasonal high water table: Greater than 6 feet

Flooding: Frequent

Ponding: None

Land capability classification, nonirrigated: 5w

Ecological site number and name: R080AY050OK, Loamy Bottomland PE 44-64

Typical profile:

A—0 to 21 inches; silt loam

Bw—21 to 36 inches; silt loam

Ck—36 to 80 inches; stratified very fine sandy loam to silty clay loam

Additional Components

Easpur soils: 10 percent of the map unit

Pulaski soils: 10 percent of the map unit

Tribbey soils: 5 percent of the map unit

95—Pulaski fine sandy loam, 0 to 1 percent slopes, occasionally flooded

Map Unit Setting

Major land resource area: 84A

Elevation: 700 to 1,500 feet

Mean annual precipitation: 26 to 40 inches

Mean annual air temperature: 57 to 65 degrees F

Frost-free period: 200 to 240 days

Major Component Description

Pulaski

Extent: 85 percent of the map unit

Geomorphic setting: Flood plains in river valleys

Parent material: Coarse-loamy alluvium

Slope: 0 to 1 percent

Surface runoff class: Negligible

Soil depth: Greater than 60 inches

Slowest permeability class of the soil to a depth of 60 inches or above a restrictive layer: Moderately rapid

Slowest permeability class within a depth of 80 inches: Moderately rapid

Drainage class: Well drained

Available water capacity: About 9.0 inches

Depth to the top of the seasonal high water table: Greater than 6 feet

Flooding: Occasional

Ponding: None

Land capability classification, nonirrigated: 2e

Ecological site number and name: R084AY050OK, Loamy Bottomland PE 48-64

Typical profile:

Ap—0 to 8 inches; fine sandy loam

C1—8 to 35 inches; fine sandy loam

C2—35 to 80 inches; stratified loamy fine sand to loam

Additional Components

Tribbey soils: 7 percent of the map unit

Easpur soils: 5 percent of the map unit

Ashport soils: 3 percent of the map unit

96—Ashport silt loam, 0 to 1 percent slopes, occasionally flooded

Map Unit Setting

Major land resource area: 80A

Elevation: 700 to 1,500 feet

Mean annual precipitation: 26 to 40 inches

Mean annual air temperature: 57 to 65 degrees F

Frost-free period: 190 to 240 days

Major Component Description

Ashport

Extent: 85 percent of the map unit

Geomorphic setting: Flood plains in river valleys

Parent material: Fine-silty alluvium

Slope: 0 to 1 percent

Surface runoff class: Negligible

Soil depth: Greater than 60 inches

Slowest permeability class of the soil to a depth of 60 inches or above a restrictive layer: Moderate

Slowest permeability class within a depth of 80 inches: Moderate

Drainage class: Well drained

Available water capacity: About 11.8 inches

Depth to the top of the seasonal high water table: Greater than 6 feet

Flooding: Occasional

Ponding: None

Land capability classification, nonirrigated: 2w

Ecological site number and name: R080AY050OK, Loamy Bottomland PE 44-64

Typical profile:

Ap—0 to 9 inches; silt loam

Bw—9 to 20 inches; silt loam

Ck—20 to 49 inches; stratified silt loam to silty clay loam

Ab—49 to 80 inches; silty clay loam

Additional Components

Easpur soils: 5 percent of the map unit

Lomill soils: 5 percent of the map unit

Pulaski soils: 3 percent of the map unit

Lebron soils: 2 percent of the map unit

97—Canadian fine sandy loam, 1 to 3 percent slopes, rarely flooded

Map Unit Setting

Major land resource area: 80A

Elevation: 700 to 2,200 feet

Mean annual precipitation: 22 to 40 inches

Mean annual air temperature: 57 to 64 degrees F

Frost-free period: 185 to 230 days

Major Component Description

Canadian

Extent: 85 percent of the map unit

Geomorphic setting: Flood plains in river valleys

Parent material: Loamy alluvium

Slope: 1 to 3 percent

Surface runoff class: Very low

Soil depth: Greater than 60 inches

Slowest permeability class of the soil to a depth of 60 inches or above a restrictive layer: Moderately rapid

Slowest permeability class within a depth of 80 inches: Moderately rapid

Drainage class: Well drained

Available water capacity: About 8.2 inches

Depth to the top of the seasonal high water table: Greater than 6 feet

Flooding: Rare

Ponding: None

Land capability classification, nonirrigated: 2e

Ecological site number and name: R080AY050OK, Loamy Bottomland PE 44-64

Typical profile:

Ap—0 to 18 inches; fine sandy loam

Bw—18 to 28 inches; fine sandy loam

C1—28 to 42 inches; fine sandy loam

C2—42 to 64 inches; loamy fine sand

Additional Components

Goodnight soils: 6 percent of the map unit

Derby soils: 4 percent of the map unit

Gracemore soils: 3 percent of the map unit

Lebron soils: 2 percent of the map unit

98—Port-Urban land complex, 0 to 1 percent slopes, occasionally flooded

Map Unit Setting

Major land resource area: 80A

Elevation: 700 to 2,200 feet

Mean annual precipitation: 22 to 40 inches

Mean annual air temperature: 57 to 64 degrees F

Frost-free period: 185 to 230 days

Major Component Description

Port

Extent: 45 percent of the map unit

Geomorphic setting: Flood plains in valleys

Parent material: Calcareous, loamy alluvium

Slope: 0 to 1 percent

Surface runoff class: Negligible

Soil depth: Greater than 60 inches

Slowest permeability class of the soil to a depth of 60 inches or above a restrictive layer: Moderate

Slowest permeability class within a depth of 80 inches: Moderate

Drainage class: Well drained

Available water capacity: About 11.8 inches

Depth to the top of the seasonal high water table: Greater than 6 feet

Flooding: Occasional

Ponding: None

Land capability classification, nonirrigated: 2w

Typical profile:

A—0 to 29 inches; silt loam

Bw—29 to 54 inches; silty clay loam

Ck—54 to 78 inches; stratified silt loam to silty clay loam

Urban land

Extent: 45 percent of the map unit

Geomorphic setting: Urban land

Parent material: Loamy mine spoil or earthy fill

Slope: 0 to 1 percent

Surface runoff class: Very high

Land capability classification, nonirrigated: 8

Additional Components

Lomill soils: 4 percent of the map unit

Easpur soils: 3 percent of the map unit

Gracemore soils: 3 percent of the map unit

99—Urban land

Map Unit Setting

Major land resource area: 80A

Elevation: 700 to 2,000 feet

Mean annual precipitation: 22 to 40 inches

Mean annual air temperature: 57 to 64 degrees F

Frost-free period: 185 to 230 days

Major Component Description

Urban land

Extent: 100 percent of the map unit

Geomorphic setting: Urban land

Parent material: Mine spoil or earthy fill

Slope: 0 to 5 percent

Surface runoff class: Very high

Land capability classification, nonirrigated: 8

AstA—Ashport silt loam, 0 to 1 percent slopes, frequently flooded

Map Unit Setting

Major land resource area: 80A

Elevation: 700 to 1,500 feet

Mean annual precipitation: 26 to 40 inches

Mean annual air temperature: 57 to 65 degrees F

Frost-free period: 200 to 240 days

Major Component Description

Ashport

Extent: 88 percent of the map unit

Geomorphic setting: Flood plains in river valleys

Parent material: Fine-silty alluvium

Slope: 0 to 1 percent

Surface runoff class: Negligible

Soil depth: Greater than 60 inches

Slowest permeability class of the soil to a depth of 60 inches or above a restrictive layer: Moderate

Slowest permeability class within a depth of 80 inches: Moderate

Drainage class: Well drained

Available water capacity: About 11.8 inches

Depth to the top of the seasonal high water table: Greater than 6 feet

Flooding: Frequent

Ponding: None

Land capability classification, nonirrigated: 5w

Ecological site number and name: R080AY050OK, Loamy Bottomland PE 44-64

Typical profile:

A—0 to 10 inches; silt loam

Bw—10 to 24 inches; silt loam

Ab—24 to 36 inches; silt loam

Bwb1—36 to 48 inches; silt loam

Bwb2—48 to 64 inches; silty clay loam

Additional Components

Pulaski soils: 5 percent of the map unit

Miller soils: 4 percent of the map unit

Easpur soils: 3 percent of the map unit

DAM—Large dam

Map Unit Setting

Major land resource area: 80A

Elevation: 700 to 2,000 feet

Mean annual precipitation: 22 to 40 inches

Mean annual air temperature: 57 to 64 degrees F

Frost-free period: 185 to 230 days

Major Component Description

Large dam

Extent: 100 percent of the map unit

Geomorphic setting: Artificial levees

Parent material: Mine spoil or earthy fill

Slope: 0 to 45 percent

Surface runoff class: Very high

Land capability classification, nonirrigated: 8

M-W—Miscellaneous water

Map Unit Setting

Major land resource area: 80A

Elevation: 250 to 4,000 feet

Mean annual precipitation: 22 to 48 inches

Mean annual air temperature: 57 to 64 degrees F

Frost-free period: 190 to 240 days

Major Component Description

Miscellaneous water

Extent: 100 percent of the map unit

Definition: This map unit consists of areas of waste water. Examples include sewage lagoons and impoundments for industrial waste water.

Geomorphic setting: Sewage lagoons

Land capability classification, nonirrigated: 8

W—Water

Map Unit Setting

Major land resource area: 80A

Elevation: 250 to 4,000 feet

Mean annual precipitation: 22 to 48 inches

Mean annual air temperature: 57 to 64 degrees F

Frost-free period: 190 to 240 days

Major Component Description

Water

Extent: 100 percent of the map unit

Definition: This map unit consists of areas of fresh water, including ponds, lakes, and rivers.

Geomorphic setting: Valleys

Land capability classification, nonirrigated: 8

Use and Management of the Soils

For general and detailed information regarding the use and management of the map units in this survey, see the soil reports and report descriptions on the Web Soil Survey at <http://websoilsurvey.nrcs.usda.gov>. A soil survey is an inventory and evaluation of the soils in the survey area. It can be used to adjust land uses to the limitations and potentials of natural resources and the environment. Also, it can help to prevent soil-related failures in land uses.

In preparing a soil survey, soil scientists, conservationists, engineers, and others collect extensive field data about the nature and behavioral characteristics of the soils. They collect data on erosion, droughtiness, flooding, and other factors that affect various soil uses and management. Field experience and collected data on soil properties and performance are used as a basis in predicting soil behavior.

Information developed during a soil survey can be used to plan the use and management of soils for crops and pasture; as rangeland and woodland; as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other recreational facilities; and for wildlife habitat. It can be used to identify the potentials and limitations of each soil for specific land uses and to help prevent construction failures caused by unfavorable soil properties.

Interpretive ratings help engineers, planners, and others understand how soil properties influence important nonagricultural uses, such as building site development and construction materials. The ratings indicate the most restrictive soil features affecting the suitability of the soils for these uses.

Soils are rated in their natural state. Only normal practices for the rated use are considered. Unusual modifications to the site or soil material are not considered in the ratings. Where soils have limitations, engineers and others may be able to modify soil features or adjust the plans for a structure to compensate for most of the limitations. Most of these modifications, however, are costly. The final decision in selecting a site for a particular use generally involves weighing the costs of site preparation and maintenance.

Planners and others using soil survey information can evaluate the effect of specific land uses on productivity and on the environment in all or part of the survey area. The survey can help planners to maintain or create a land use pattern in harmony with the natural soil.

Contractors can use a survey to locate sources of sand, gravel, roadfill, and topsoil. They can use it to identify areas where bedrock, wetness, or very firm soil layers can cause difficulty in excavation.

Health officials, highway officials, engineers, and others may also find a soil survey useful. The survey can help them plan the safe disposal of wastes and locate sites for pavements, sidewalks, campgrounds, playgrounds, lawns, and trees and shrubs.

Rangeland

Mark Moseley, range conservationist, Natural Resources Conservation Service, helped prepare this section.

Range, grazed forestland, and native pasture provide forage for livestock in the survey area.

Range is defined as land on which the native vegetation (the climax, or natural potential, plant community) is predominantly grasses, grasslike plants, forbs, and shrubs suitable for grazing and browsing. Range includes natural grasslands, savannas, many wetlands, some deserts, tundra, and certain shrub and forb communities. Range receives no regular or frequent cultural treatment. The composition and production of the plant community are determined by soil, climate, topography, overstory canopy, and grazing management.

Grazed forestland is defined as land on which the understory includes, as an integral part of the forest plant community, plants that can be grazed without significant impairment of other forest values.

Native pasture is defined as land on which the potential (climax) vegetation is forest but which is used and managed primarily for the production of native forage plants. Native pasture includes cutover forestland and forestland that has been cleared and is managed for native or naturalized forage plants.

Forty-seven percent of Cleveland County is rangeland or native pastureland. Most of these areas are on gently sloping to steep side slopes. A few are on narrow, very gently sloping to sloping summits. A few native-grass meadows are managed for hay production in the central and north-central parts of the county. Three distinct rangeland types are present. In the southeastern part of the county, most of the soils are loamy and are moderately deep or shallow over sandstone. These soils support an oak savannah rangeland that has low productivity due to the shallow rooting depth and low available water capacity. In the northeastern and western parts of the county, the soils are loamy and are dominantly moderately deep. There are also some shallow and deep soils over shale or over shale interbedded with sandstone. The soils in the northeastern and western parts of the county support mid and tall grasses, and productivity is moderate. In the north-central, central, and south-central parts of the county, the soils are loamy and are dominantly moderately deep. There are also some shallow and deep soils over sandstone or over sandstone interbedded with shale. The soils in the north-central, central, and south-central parts of the county support tall and mid grasses that are moderately productive.

Approximately 75 percent of the annual production on rangeland grows in April, May, and June, coinciding with spring rains and moderate temperatures. A secondary growth period generally occurs in September and October, coinciding with fall rains and cooling temperatures.

Most of the local ranches and livestock farms are cow-calf operations. There are also some pure stocker enterprises and some ranches that diversify their cow-calf operation with stockers to provide greater flexibility.

Several livestock operations supplement the grazing of native rangeland with introduced grasses, such as bermudagrass and "plains" bluestem. Forage crops are also used. Protein, hay, and small-grain crops are used to supplement livestock through winter.

Droughts of varying lengths occur, and short-term summer droughts are common. Longer periods of drought, some lasting several months, are also frequent.

The pre-settlement vegetation evolved with periodic natural fires, droughts, migratory grazing by bison, and impact from many other wildlife species. The bison would heavily impact an area and then move to other grazing range.

Early settlement brought continuous grazing and eliminated much of the high-quality vegetation on some ecological sites. Areas that were once open-savannah

ecological sites with a mixture of grasses, forbs, and scattered trees are now covered with oaks, a few tall and mid grasses, and low successional grasses and forbs. Some prairie sites are now growing low successional grasses and forbs instead of tall grasses. The amount of forage presently produced may be less than half of that originally produced. On some sites, the number of eastern redcedar has increased significantly due to a lack of prairie fires. Remnants of the original plant species are still found on most rangeland, however, and progressive grazing management can allow these high quality plants to re-establish without reseeding.

The table "Rangeland Productivity and Characteristic Plant Communities" is available on the Soil Data Mart at <http://soildatamart.nrcs.usda.gov>. This table shows, for each soil, the ecological site; the total annual production of vegetation in favorable, normal, and unfavorable years; the characteristic vegetation; and the average percentage of each species. Only those soils that are used as rangeland or are suited to use as rangeland are listed. Explanation of the column headings in this table follows.

An *ecological site* for rangeland is a distinctive kind of land and vegetation with specific physical characteristics that makes it different from other kinds of land in its ability to produce a distinctive kind and amount of vegetation.

Many different ecological sites are in the survey area. Over time, the combination of plants best suited to a particular soil and climate has become dominant. If the soil is not excessively disturbed, this group of plants is the natural plant community for the site. Natural plant communities are not static but vary slightly from year to year and place to place.

The relationship between soils and vegetation was ascertained during this survey; thus, ecological sites generally can be determined directly from the soil map. Soil properties that affect moisture supply and plant nutrients have the greatest influence on the productivity of range plants. Soil reaction, salt content, and a seasonal high water table are also important. The "Electronic Field Office Technical Guide," which is available at the local office of the Natural Resources Conservation Service or online at <http://www.nrcs.usda.gov/technical/efotg/>, can provide specific information about ecological sites.

Total production is the amount of vegetation that can be expected to grow annually on well managed rangeland. It includes all vegetation, whether or not it is palatable to grazing animals. It includes the current year's growth of leaves, twigs, and fruit of woody plants. It does not include the increase in stem diameter of trees and shrubs. It is expressed in pounds per acre of air-dry vegetation for favorable, normal, and unfavorable years. In a favorable year, the amount and distribution of precipitation and the temperatures make growing conditions substantially better than average. In a normal year, growing conditions are near the historical monthly average. In an unfavorable year, growing conditions are well below average, generally because of low available soil moisture. Figure 2 shows a typical growth curve that represents the percentage of total growth that occurs each month for native vegetation and other forage. Dry weight is the total annual yield per acre of air-dry vegetation. Yields are adjusted to a percent of air-dry moisture content. The relationship of green weight to air-dry weight varies according to such factors as stage of maturity, exposure, amount of shade, recent rains, and unseasonable dry periods.

Characteristic vegetation consists of the grasses, forbs, and shrubs that make up most of the potential natural plant community on each soil. The plants are listed by common name. Under composition, the anticipated percentage of the total annual production is given for each species making up the characteristic vegetation. The amount that can be used as forage depends on the kinds of grazing animals and on the grazing season.

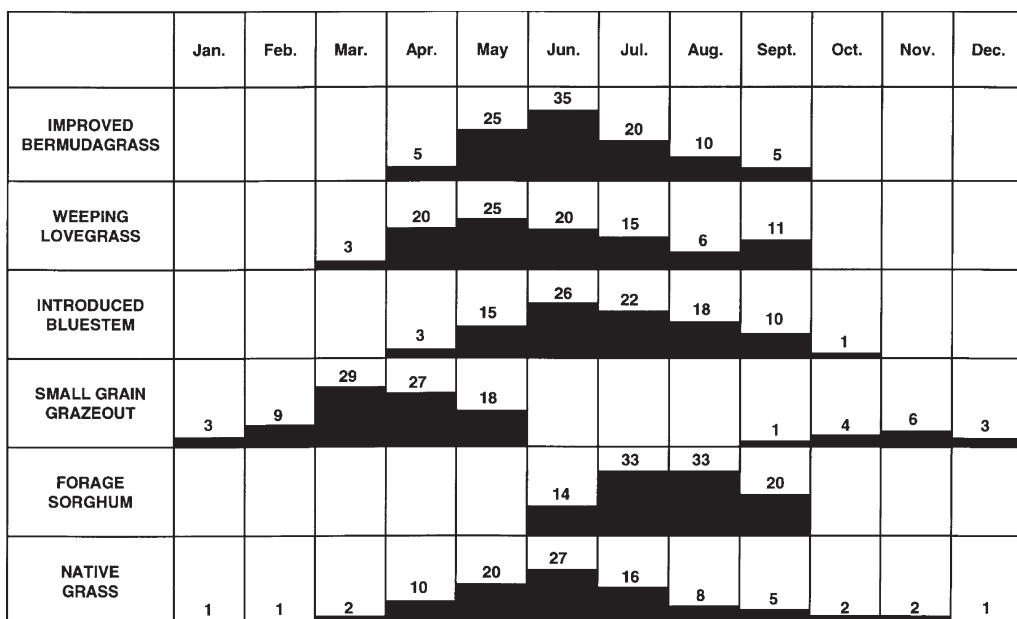


Figure 2.—Typical growth curves for various kinds of forage in the survey area. The growth curve for each kind of forage indicates the percentage of the total annual growth that occurs each month.

Similarity Index

The similarity index indicates on a percentage basis the extent to which the present plant community resembles a specified vegetative state on an ecological site. The Natural Resources Conservation Service uses similarity index two ways.

The first use compares the present vegetation on an ecological site to the presumed historic vegetation for that site. A similarity index of 70 would suggest that the present plant community contains 70 percent of the presumed historic plant community for that site. This comparison provides a basis for examining the extent and direction of changes between current vegetation and historic vegetation.

The second use measures how near the current plant community is to the landowners goal for the land. The management goal for rangeland is not necessarily a similarity index of 100 as compared to the historic plant community. Therefore, the similarity index can represent the percentage of the plant community that resembles a desired plant community.

Abnormal disturbances that change the natural plant community include repeated overuse by livestock, excessive burning, erosion, and cultivation. Grazing animals select the most palatable plants. These plants eventually die if they are continually grazed at a severity that does not allow for recovery. A very severe disturbance can completely destroy the natural community. Under such conditions, the less desirable plants, such as annuals and weed-like plants, can increase in abundance. If the plant community and the soils have not deteriorated significantly and proper range management is applied, the site can eventually return to predominantly natural plants.

Knowledge of the ecological site is necessary as a basis for planning and applying the management needed to maintain or improve the desired plant community for selected uses. Such information is needed to support management objectives, planned grazing systems, stocking rates, and wildlife management practices; to improve the potential of an area for recreational uses; and to improve the condition of watersheds.

Rangeland Management

Rangeland management requires a knowledge of the kinds of soil in an area and of the potential natural plant community. It also requires an evaluation of the similarity index.

Effective range management conserves rainfall, enhances water quality, reduces the hazard of downstream flooding, improves yields, provides forage for livestock and wildlife, enhances recreational opportunities, and protects the soil. The main management concern is recognizing important changes in the plant cover or the range trend. These changes occur gradually and can be overlooked.

Each range manager should evaluate the type of plant community that best supports the ranch and then apply management and ecological principles to achieve the goals. The desired plant community should be within the capabilities of the land.

The range management practices used in the county include prescribed grazing, stock-water developments, and fences. If undesirable plants become dominant, range seeding, brush management, or prescribed burning are commonly used.

Range management includes four major considerations:

- *Grazing distribution*, which is achieved by managing livestock to graze all parts of the grazing unit equally.
- *Selective grazing*, which occurs because animals graze preferred plants to balance their diets. If selective grazing occurs repeatedly, the preferred plants are damaged.
- *Proper stocking rates*, which are achieved by balancing animal numbers with forage production.
- *Rest periods*, during which grazed plants are given enough rest to recover and to maintain growth.

An important principle of range management is that forage production is controlled by rainfall while composition is determined by grazing management.

The setting of stocking rates is not an exact science because of influences from grazing management, season of use, mix of livestock, and seasonal production of forage. Some general rules, however, can be helpful. To maintain a nutritional cover of plants, about 50 percent of the annual growth of the most important grazing plants should remain at the end of the grazing season. Plants can be removed not only through grazing by livestock but also through grazing by rodents, insects, and wildlife and through the deterioration caused by climatic variations. Because of these factors, a safe initial stocking rate for livestock should be calculated on the basis of 25 percent of the total annual growth, by weight, of the vegetation.

For example, production could be 3,500 pounds per acre of air-dry grasses, forbs, and limited woody species for an average season on a Loamy Prairie ecological site with a similarity index of 70 to the historic plant community. Twenty-five percent of this production would be 875 pounds per acre.

A 1,000-pound cow and her calf is equivalent to one animal unit (AU) and consume about 2.6 percent of her body weight (26 pounds) of forage per day. Therefore, in 1 month an animal unit could consume 790 pounds of native vegetation, depending on the quality and stage of growth of the plants (26 pounds per day times 365 days per year divided by 12 months per year).

Dividing 875 pounds (the forage allocation) by 26 pounds (the forage required per day for 1 animal unit) suggests that 1 acre of Loamy Prairie ecological site with a similarity index of 70 would feed 1 cow and calf for 33.6 days. To convert forage available from 1 acre to animal unit months (AUM), the available forage (875 pounds) is divided by the amount required to feed 1 animal unit for 1 month (790 pounds). Therefore, 1 acre would provide 1.1 AUM of grazing and 10.9 acres would feed 1 cow and calf for 12 months.

Another approach is to calculate the annual forage needs of an animal unit (790 pounds per month times 12 months equals 9,490 pounds). Dividing the 875 pounds of usable forage per acre into the 9,490 pounds needed by the cow and calf reveals that approximately 10.9 acres is needed for 1 cow annually. Stocking rate calculations should be adjusted for animal size, grazing system, and grazing season.

More information about planning a grazing program is available from the local office of the Natural Resources Conservation Service.

Ecological Site Descriptions

Twenty-one ecological sites are recognized in Cleveland County. The ecological site identifier has eleven characters. The "R" indicates an ecological site. The next four characters identify the major land resource area. The sixth character identifies the major land resource unit subdivision. The next three characters identify the individual ecological site number. The final two characters identify the state. The identifier is followed by the proper name for the ecological site. The following descriptions include a list of the plants that are characteristic of the sites. Detailed ecological site descriptions are available at the local office of the Natural Resources Conservation Service.

R080AY010OK, Claypan Prairie (North) PE 44-64.—This site is on uplands in areas of level to gently sloping, deep, loamy soils that have a dense, clayey subsoil. The historic climax vegetation includes little bluestem, big bluestem, switchgrass, dropseed species, Indiangrass, Canada wildrye, sideoats grama, and eastern gamagrass. Forbs include Maximilian sunflower, compassplant, western ragweed, Louisiana sagewort, false boneset, rainlily, Carolina larkspur, purple coneflower, and daisy fleabane. Legumes include white prairie clover, prairie clover species, Illinois bundleflower, littleleaf sensitive-briar, and slimleaf scurfpea. Shrubs and vines include leadplant, ceanothus, smooth sumac, and buckbrush.

R080AY014OK, Deep Sand PE 44-64.—This site is in level to gently rolling areas that have low dune topography and very little runoff. The soils have low water storage capacity. The historic climax vegetation includes sand bluestem, switchgrass, Indiangrass, giant sandreed, little bluestem, dropseed species, sideoats grama, sand lovegrass, Canada wildrye, and Virginia wildrye. Forbs include silky sophora, roundhead lespedeza, Maximilian sunflower, spiderwort, Engelmann's daisy, smallflowered milkvetch, sensitive partridge pea, silktop dalea, white prairie clover, Illinois bundleflower, sessile tickclover, American birds-foot trefoil, lemon scurfpea, slimflower scurfpea, and Virginia tephrosia. Shrubs and woody species include sand sagebrush, leadplant, Jersey tea, soapweed yucca, skunkbush sumac, smooth sumac, and pricklypear.

R080AY045OK, Heavy Bottomland PE 44-64.—This site is on bottomlands. The soils are clayey and droughty but are excessively wet during periods of high rainfall. The historic climax vegetation includes switchgrass, prairie cordgrass, Virginia wildrye, western wheatgrass, vine mesquite, buffalograss, longspike tridens, white tridens, and Texas wintergrass. Woody species include mesquite.

R080AY050OK, Loamy Bottomland PE 44-64.—This site is on flood plains and terraces. The soils are nearly level to sloping, loamy, and very deep. They are subject to stream overflow and runoff from hillsides. The historic climax vegetation includes big bluestem, switchgrass, Indiangrass, eastern gamagrass, Florida paspalum, and little bluestem. Cool-season grasses include Canada wildrye, Virginia wildrye, Texas bluegrass, and western wheatgrass. Forbs include Maximilian sunflower, stiff sunflower, and Jerusalem artichoke. Woody species include elm, willow, pecan, oak, cottonwood, green ash, and coralberry.

R080AY056OK, Loamy Prairie PE 44-64.—This site is in areas of deep, loamy soils on uplands. The historic climax vegetation includes little bluestem, big bluestem,

Indiangrass, switchgrass, Canada wildrye, sideoats grama, and blue grama. Legumes include leadplant, wild indigo, scurfpea, and prairie acacia. Woody species are rare.

R080AY068OK, Sandy Bottomland PE 44-64.—This site is in areas of sandy, droughty soils that are subject to wind erosion and are on first and second bottoms. The historic climax vegetation includes sand bluestem, Indiangrass, little bluestem, and switchgrass. Woody species include willow and cottonwood.

R080AY073OK, Sandy Prairie PE 44-64.—This site is in areas of deep, moderately sandy soils on uplands that have hummocky or gently rolling to steeply rolling topography. The historic climax vegetation includes sand bluestem, little bluestem, Indiangrass, switchgrass, sideoats grama, and blue grama. Woody species include skunkbush.

R080AY083OK, Shallow Prairie PE 44-64.—This site is in areas of gently sloping to moderately steep, shallow soils in prairies. Rock outcrop is common on the surface and typically covers 15 to 20 percent of the area. The historic climax vegetation includes little bluestem, big bluestem, Indiangrass, switchgrass, dropseed species, and Scribner's panicum. Legumes include catclaw sensitive-brier, Illinois bundleflower, Virginia tephrosia, leadplant, and white, purple, and roundhead prairie clovers.

R080AY091OK, Slickspot PE 44-64.—This site is on uplands in areas of level to gently sloping, deep, loamy soils that have a clayey, blocky, alkali subsoil. The historic climax vegetation includes alkali sacaton, switchgrass, western wheatgrass, tall dropseed, white tridens, blue grama, dropseed, gummy lovegrass, fall witchgrass, yellow neptunia, mourning lovegrass, and purple threeawn. Forbs include dotted gayfeather, curly cup gumweed, goldenweed, and hairy goldenaster.

R080AY095OK, Subirrigated PE 44-64.—This site is on uplands and on flood plains. The soils are deep, nearly level to very gently sloping, and sandy. They have a high water table. The historic climax vegetation includes switchgrass, big bluestem, Indiangrass, and eastern gamagrass. Woody species include willow and cottonwood.

R080AY097OK, Subirrigated (Saline) PE 44-64.—This site is on low terraces and flood plains. The soils are deep, level, loamy, and strongly affected by salinity. The historic climax vegetation includes switchgrass, western wheatgrass, vine mesquite, prairie cordgrass, alkali sacaton, tall dropseed, and inland saltgrass. Forbs include sunflower. Woody species include willow, cottonwood, and baccharis.

R080AY810OK, Eroded Claypan Prairie (North) PE 44-64.—This site is in areas where part or all of the A horizon has been removed by erosion. The soil integrity has been changed. Because of the past erosion and the probability of ongoing erosion, the plant community can be determined only by onsite inspection. The productivity of this site has not been determined. See R080AY010OK, Claypan Prairie (North) PE 44-64, for the historic climax vegetation on the parent site.

R080AY856OK, Eroded Loamy Prairie PE 44-64.—This site is in areas where part or all of the A horizon has been removed by erosion. The soil integrity has been changed. Because of the past erosion and the probability of ongoing erosion, the plant community can be determined only by onsite inspection. The productivity of this site has not been determined. See R080AY056OK, Loamy Prairie PE 44-64, for the historic climax vegetation on the parent site.

R080AY891OK, Eroded Slickspot PE 44-64.—This site is in areas where part or all of the A horizon has been removed by erosion. The soil integrity has been changed. Because of the past erosion and the probability of ongoing erosion, the plant community can be determined only by onsite inspection. The productivity of this site has not been determined. See R080AY091OK, Slickspot PE 44-64, for the historic climax vegetation on the parent site.

R084AY018OK, Deep Sand Savannah PE 48-64.—This site is in areas of nearly level to moderately steep, coarse textured soils on uplands. The historic climax

vegetation includes big bluestem, sand bluestem, Indiangrass, little bluestem, switchgrass, broadleaf uniola, beaked panicum, purpletop, tall dropseed, Scribner's panicum, and sand lovegrass. Woody species include post oak, blackjack oak, hickory, winged elm, and persimmon.

R084AY050OK, Loamy Bottomland PE 48-64.—This site is in areas of deep, loamy soils on bottomlands that are subject to occasional to frequent overflow from streams and runoff from hillsides. The historic climax vegetation includes big bluestem, switchgrass, Indiangrass, eastern gamagrass, Florida paspalum, Canada wildrye, Virginia wildrye, Texas bluegrass, and western wheatgrass. Forbs include Maximilian sunflower, stiff sunflower, and Jerusalem artichoke. Woody species include elm, willow, pecan, oak, cottonwood, green ash, and coralberry.

R084AY075OK, Sandy Savannah PE 44-64.—This site is in areas of gently sloping to steep fine sandy loams that support mid grasses and tall grasses mixed with an overstory of oak. The historic climax vegetation includes sand bluestem, little bluestem, Indiangrass, switchgrass, and sideoats grama. Forbs include Maximilian sunflower, ashy sunflower, stiff sunflower, compassplant, daisy fleabane, goldenrods, and numerous other species in trace amounts. Woody species include post oak, blackjack oak, and hickory.

R084AY089OK, Shallow Savannah PE 48-64.—This site is in rolling savannahs that have an overstory of post oak and blackjack oak. The historic climax vegetation includes little bluestem, big bluestem, switchgrass, Indiangrass, Canada wildrye, hairy grama, tall dropseed, and meadow dropseed. Legumes include lespedeza, roundhead lespedeza, slender lespedeza, prairie clover, and Virginia tephrosia. Woody species include post oak and blackjack oak.

R084AY095OK, Subirrigated PE 48-64.—This site is on uplands and flood plains. The soils are deep, nearly level to very gently sloping, and sandy. They have a high water table. The historic climax vegetation includes switchgrass, big bluestem, Indiangrass, and eastern gamagrass. Woody species include willow and cottonwood.

R084AY876OK, Eroded Sandy Savannah PE 48-64.—This site is in areas where part or all of the A horizon has been removed by erosion. The soil integrity has been changed. Because of the past erosion and the probability of ongoing erosion, the plant community can be determined only by onsite inspection. The productivity of this site has not been determined. See R084AY075OK, Sandy Savannah PE 44-64, for the historic climax vegetation on the parent site.

R084AY889OK, Eroded Shallow Savannah PE 48-64.—This site is in areas where part or all of the A horizon has been removed by erosion. The soil integrity has been changed. Because of the past erosion and the probability of ongoing erosion, the plant community can be determined only by onsite inspection. The productivity of this site has not been determined. See R084AY089OK, Shallow Savannah PE 48-64, for the historic climax vegetation on the parent site.

Soil Properties

Data relating to soil properties are collected during the course of a soil survey. Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine grain-size distribution, plasticity, and compaction characteristics.

Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help to characterize key soils.

Physical Properties of Selected Soils

The results of physical analyses of several pedons are given in the table "Physical Properties of Selected Soils." The data are for soils sampled at carefully selected sites. Soil samples were analyzed by the Soil Survey Laboratory, Lincoln, Nebraska.

Most determinations, except for those for grain-size analysis and bulk density, were made on soil material smaller than 2 millimeters in diameter. Measurements reported as percent or quantity of unit weight were calculated on an ovendry basis. The methods used in obtaining the data are indicated in the following list. The codes in parentheses refer to published methods (USDA-NRCS, 1996).

Clay—(fraction less than 0.002 mm) pipette extraction, weight percentages of all material less than 2 mm (3A1).

Silt—(0.002-0.05 mm fraction) pipette extraction, weight percentages of all material less than 2 mm (3A1).

Sand—(0.05-2.0 mm fraction) weight percentages of material less than 2 mm (3A1).

Chemical Properties of Selected Soils

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Most determinations were made on soil material smaller than 2 millimeters in diameter. Measurements reported as percent or quantity of unit weight were calculated on an ovendry basis. The methods used in obtaining the data are indicated in the following list. The codes in parentheses refer to published methods (USDA-NRCS, 1996).

Organic carbon—wet combustion. Walkley-Black modified acid-dichromate, ferric sulfate titration (6A1c).

Extractable cations—ammonium acetate pH 7.0, atomic absorption; calcium (6N2e), magnesium (6O2d), sodium (6P2b), potassium (6Q2b).

Supplement to the Soil Survey of Cleveland County, Oklahoma

Cation-exchange capacity—sum of cations (5A3a).

Base saturation—sum of cations, TEA, pH 8.2 (5C3).

Reaction (pH)—1:1 water dilution (8C1f).

Total phosphorous—Perchloric acid; colorimetry (6S1a).

Supplement to the Soil Survey of Cleveland County, Oklahoma

Table 5.--Physical Properties of Selected Soils

[The first two digits of the sample number are the year the soil was sampled and described. The letters "OK" are the Federal Information Processing Standards (FIPS) state code for Oklahoma. The next three digits are the FIPS code for the county. The last two digits are the consecutive pedon assigned in Cleveland County for the year specified. The Oklahoma State University laboratory data shows the county number as 14 rather than as 027]

Soil series and sample number	Depth	Horizon	Particle-size distribution								
			Very Coarse sand (1.0- 2.0 mm)	Coarse sand (0.5- 1.0 mm)	Medium sand (0.25- 0.50 mm)	Fine sand (0.10- 0.25 mm)	Very fine sand (0.05- 0.10 mm)	Sand (0.05- 0.10 mm)	Silt (0.05- 0.002 mm)	Clay (<0.002 mm)	
Darsil loamy fine sand: 1 (S76OK027-23)	0-5	A1	0.1	0.1	2.7	66.3	13.9	83.1	10.6	6.3	
	5-17	AC	0.1	0.1	3.8	74.3	11.8	90.1	4.7	5.2	
Kirkland silt loam: 2 (S79OK027-32)	0-13	A1	0.1	0.1	0.4	1.4	10.7	12.7	67.9	19.4	
	13-22	B21t	0.1	0.1	0.2	0.9	5.4	6.7	48.9	44.4	
	22-28	B22t	0.1	0.1	0.3	0.5	6.1	7.1	53.4	39.5	
	28-47	B23tca	0.1	0.1	0.3	1.2	5.7	7.4	53.8	38.8	
	47-60	B24tsa	0.1	0.2	0.4	1.5	6.1	8.3	47.8	43.9	
	60-75	B21tbsa	0.1	0.1	0.2	0.7	3.4	4.5	52.3	43.2	
	75-87	B22tb	0.1	0.1	0.1	0.2	1.8	2.3	55.7	42.0	
	87-104	BCb	0.1	0.1	1.5	7.1	4.6	13.4	50.9	35.7	
Kirkland silt loam: 3 (S81OK027-39)	0-95	Ap	0.4	0.4	0.8	1.6	7.9	11.1	72.0	16.9	
	9-11	A2	0.4	0.8	1.3	1.6	6.8	10.9	71.5	17.6	
	11-25	B21t	0.1	0.2	0.5	0.9	4.0	5.7	49.9	44.4	
	25-36	B22tca	0.2	0.3	0.4	1.0	4.6	6.5	55.8	37.7	
	36-49	B23tca	0.3	0.4	0.7	1.4	5.8	8.6	58.7	32.1	
	49-58	B24t	0.1	0.3	1.0	1.9	6.8	10.1	59.8	30.1	
	58-76	B31	0.2	0.4	0.8	1.0	5.7	8.1	53.7	38.2	
	76-86	B32	0.1	0.1	0.2	0.5	2.4	3.3	52.2	44.5	
Dougherty loamy fine sand: 4 (S74OK027-1)	0-7	A1	0.1	0.9	30.8	36.0	11.9	79.7	15.3	5.0	
	7-15	A21	0.1	0.9	27.4	27.4	11.2	79.8	16.4	3.8	
	15-23	A22	0.1	0.8	25.9	25.9	11.4	77.4	16.3	6.3	
	23-27	B21t	0.1	0.5	15.2	15.2	13.1	62.1	21.6	16.3	
	27-39	B22t	0.1	0.2	10.8	10.8	19.9	55.9	22.8	21.3	
	39-65	B31	0.1	0.2	5.6	5.65	26.2	57.1	25.4	17.5	
	65-85	C	0.1	2.4	25.3	22.9	15.8	66.5	23.5	10.0	
Harrah fine sandy loam: 5 (S78OK027-31)	0-5	A1	0.1	0.3	33.8	31.8	8.3	74.3	13.7	12.0	
	5-13	A21	0.1	0.3	20.2	47.3	10.5	78.4	14.7	6.9	
	13-25	A22	0.1	0.3	20.4	47.5	10.9	79.2	12.0	8.8	
	25-35	B21t	0.1	0.2	12.9	38.0	11.2	62.4	13.4	24.2	
	35-57	B22t	0.3	0.2	11.4	35.0	12.7	59.6	16.2	24.2	
	57-70	B21tb	0.1	0.3	9.0	33.4	12.7	55.5	16.5	28.0	
	70-85	B22tb	0.1	0.3	12.4	29.3	9.0	51.1	19.7	29.2	
	85-96	B3b	0.1	0.1	9.4	22.3	7.3	39.3	35.3	25.5	

See footnotes at end of table.

Supplement to the Soil Survey of Cleveland County, Oklahoma

Table 5.--Physical Properties of Selected Soils--Continued

Soil series and sample number	Depth	Horizon	Particle-size distribution								
			Very Coarse sand (1.0- 2.0 mm)	Coarse sand (0.5- 1.0 mm)	Medium sand (0.25- 0.50 mm)	Fine sand (0.10- 0.25 mm)	Very fine sand (0.05- 0.10 mm)	Sand (0.05- 0.10 mm)	Silt (0.05- 0.002 mm)	Clay (<0.002 mm)	
Littleaxe loamy fine sand: ⁶ (S74OK027-2)	0-7	A1	0.1	0.1	14.4	49.7	9.6	73.9	22.3	3.8	
	7-16	A2	0.1	0.2	18.4	52.5	7.6	78.8	18.7	2.5	
	16-60	B21t	0.1	0.1	11.4	38.2	5.2	55.0	21.8	23.2	
	28-37	B22t	0.1	0.1	18.4	40.7	5.1	64.4	17.4	18.2	
	37-43	B31	0.1	0.1	25.1	41.1	5.2	71.6	14.6	13.8	
	43-52	B32	0.1	0.1	19.3	45.2	4.0	68.7	15.0	16.3	
	52-60	Cr	0.1	0.1	9.7	58.8	2.5	71.2	10.0	18.8	
Newalla fine sandy loam: ⁷ (S80OK027-36)	0-6	A1	0.1	0.2	10.5	53.7	8.6	73.1	13.1	13.8	
	6-9	A2	0.1	0.1	7.9	59.4	10.3	77.8	10.3	11.9	
	9-13	B2t	0.1	0.2	3.8	43.5	9.4	57.0	19.8	23.2	
	13-28	IIB21t	0.1	0.1	0.1	2.3	2.6	5.2	44.1	50.7	
	28-36	IIB22t	0.1	0.1	0.1	0.7	0.8	1.8	51.3	46.9	
	36-48	IIB3	0.2	0.1	0.2	1.3	1.1	2.9	50.7	46.4	
	48-56	IICr	0.1	0.1	0.2	0.7	2.1	3.2	35.5	61.3	
Newalla fine sandy loam: ⁸ (S80OK027-37)	0-3	A1	0.4	0.4	2.3	53.6	10.1	66.8	16.2	17.0	
	3-6	A2	0.4	0.2	2.6	59.6	9.4	72.2	12.6	15.2	
	6-10	B2t	0.2	0.1	2.4	39.8	7.8	50.3	18.4	31.3	
	10-16	IIB21t	0.2	0.2	1.1	20.2	4.4	26.1	20.0	53.9	
	16-30	IIB22t	0.2	0.2	1.0	17.6	4.0	23.0	21.9	55.1	
	30-42	IIB23tca	0.5	0.6	0.8	14.3	7.8	23.9	25.9	50.2	
	42-51	IIB24t	0.2	0.3	0.9	12.4	5.0	18.8	28.6	52.6	
Pawhuska silt loam: ⁹ (S79OK027-33)	51-58	IIB3	0.1	0.1	0.3	4.3	4.3	9.1	41.5	49.4	
	58-80	IICr	0.1	0.1	0.2	3.3	4.5	8.2	48.0	43.8	
	0-10	A1	0.1	0.2	0.8	2.3	15.7	19.1	57.1	23.8	
	10-19	B21t	0.1	0.3	0.9	2.2	8.8	12.3	49.5	38.2	
	19-26	B22t	0.1	0.2	0.6	2.0	7.9	10.8	47.9	41.3	
	26-33	B23tca	1.1	0.3	0.7	2.5	8.1	12.7	43.0	44.3	
	33-43	B24tsa	0.4	0.3	0.6	1.9	8.3	11.5	44.5	44.0	
Pawhuska silt loam: ¹⁰ (S79OK027-34)	43-57	B3sa	0.3	0.3	0.6	1.9	8.9	12.0	49.1	38.9	
	57-65	B21tb	0.1	0.2	0.4	0.8	6.3	7.8	46.9	45.3	
	65-87	B22tcab	0.1	0.2	0.4	0.1	6.8	8.6	44.9	46.7	
	87-99	B3b	0.1	0.1	0.2	0.6	3.9	4.9	49.4	45.7	
	0-3	A11p	0.2	0.2	0.7	2.4	15.7	19.2	59.5	21.3	
	3-6	A12p	0.2	0.2	0.7	2.4	12.1	15.6	63.7	20.7	
	6-20	B21t	0.1	0.1	0.4	1.1	5.3	7.0	52.3	40.7	
Pawhuska silt loam: ¹¹ (S79OK027-35)	20-28	B22t	0.3	0.2	0.6	1.8	6.1	9.0	53.4	37.6	
	0-10	A1	0.2	0.3	0.9	2.3	12.6	16.3	68.1	15.6	
	10-17	B21t	0.2	0.4	0.8	1.5	11.0	13.9	46.2	39.9	
	17-24	B22t	0.2	0.4	0.8	1.5	7.5	10.4	51.3	38.3	
	24-40	B23tsa	0.1	0.2	0.8	2.2	13.5	16.7	50.9	32.4	
	40-54	B31sa	0.1	0.2	1.1	3.2	17.2	21.8	49.5	28.7	
	54-70	B32	0.1	0.3	1.5	3.7	15.7	21.3	52.3	26.4	

¹ Darsil loamy fine sand: About 700 feet east and 50 feet south of the northeast corner of sec. 32, T. 9 N., R. 3 W. This pedon is in an area of Stephenville-Darsil-Newalla complex, 3 to 8 percent slopes. The data represents a typical pedon of Darsil loamy fine sand.

Supplement to the Soil Survey of Cleveland County, Oklahoma

² Kirkland silt loam: About 1,470 feet south and 1,050 feet west of the northeast corner of sec. 33, T. 10 N., R. 3 W. This pedon is in an area of Kirkland-Pawhuska complex, 0 to 3 percent slopes. The data represents a typical pedon of Kirkland silt loam.

³ Kirkland silt loam: About 2,150 feet south and 150 feet west of the northeast corner of sec. 21, T. 10 N., R. 3 W. This pedon is in an area of Kirkland silt loam, 0 to 1 percent slopes.

⁴ Dougherty loamy fine sand: About 1,600 feet east and 100 feet north of the southwest corner of sec. 17, T. 7 N., R. 1 W. This pedon is in an area of Dougherty-Konawa complex, 2 to 8 percent slopes. The data represents a typical pedon of Dougherty loamy fine sand.

⁵ Harrah fine sandy loam: About 2,600 feet north and 2,200 feet west of the southeast corner of sec. 24, T. 10 N., R. 1 W. The data represents a typical pedon of Harrah fine sandy loam, 3 to 8 percent slopes. The thickness of the A2 horizon is the maximum allowed in the definition of the series.

⁶ Littleaxe loamy fine sand: About 2,120 feet west and 380 feet south of the northeast corner of sec. 6, T. 8 N., R. 1 E. The data represents a typical pedon of Littleaxe loamy fine sand, 1 to 3 percent slopes.

⁷ Newalla fine loamy sand: In a road cut about 1,900 feet east of the southwest corner of sec. 23, T. 9 N., R. 1 E. This pedon is in an area of Stephenville-Darsil-Newalla complex, 3 to 8 percent slopes. Other than being too acid in the IIB21t and IIB22t horizons, the data represents a typical pedon of Newalla fine sandy loam.

⁸ Newalla fine sandy loam: About 1,900 feet east and 150 feet south of the northwest corner of sec. 21, T. 7 N., R. 1 E. This pedon is in an area of Stephenville-Darsil-Newalla complex, 3 to 8 percent slopes. The data represents a typical pedon of Newalla fine sandy loam.

⁹ Pawhuska silt loam: About 1,440 feet south and 1,500 feet west of the northeast corner of sec. 33, T. 10 N., R. 3 W. This pedon is in an area of Kirkland-Pawhuska complex, 0 to 3 percent slopes. The data represents a typical pedon of Pawhuska silt loam.

¹⁰ Pawhuska silt loam: About 2,050 feet west and 120 feet south of the northeast corner of sec. 33, T. 10 N., R. 3 W. This pedon is in an area of Kirkland-Pawhuska complex, 0 to 3 percent slopes, eroded. The data represents the upper pedon of Pawhuska silt loam. This eroded pedon was sampled for comparison to the noneroded pedon data shown in sample number S79OK27-33.

¹¹ Pawhuska silt loam: About 50 feet east and 300 feet south of the northwest corner of sec. 17, T. 10 N., R. 3 W. This pedon is in an area of Grant-Huska complex, 1 to 5 percent slopes. The data is not representative of the Pawhuska series because of the decrease in clay content in the lower horizons. The data would be representative of the Huska series if bedrock had been encountered at a depth of 40 to 60 inches.

Supplement to the Soil Survey of Cleveland County, Oklahoma

Table 6.--Chemical Properties of Selected Soils

[The first two digits of the sample number are the year the soil was sampled and described. The letters "OK" are the Federal Information Processing Standards (FIPS) state code for Oklahoma. The next three digits are the FIPS code for the county. The next two digits are the consecutive pedon assigned in Cleveland County for the year specified. The last two digits are the horizon number. The Oklahoma State University laboratory data shows the county number as 14 rather than as 027]

Soil series and sample number	Depth	Horizon	Extractable bases				Cation exchange capacity	Base saturation	Reaction 1:1	Organic matter	Total P
			Ca	Mg	K	Na					
	In		-----meg/100 g-----								
Darsil: 1											
76-OK-027-23-01	0-5	A1	3.13	1.10	0.19	0.04	4.8	89.6	6.2	1.99	230.0
76-OK-027-23-02	5-17	AC	0.74	0.37	0.06	0.03	1.5	82.1	6.7	0.53	135.0
Kirkland: 2											
79-OK-027-32-01	0-13	A1	6.27	7.07	0.44	0.27	16.1	70.9	4.9	2.58	277.5
79-OK-027-32-02	13-22	B21t	11.17	14.67	0.35	3.31	27.8	81.6	6.0	1.58	302.5
79-OK-027-32-03	22-28	B22t	11.48	15.05	0.25	4.86	28.3	88.2	6.6	1.29	282.5
79-OK-027-32-04	28-47	B23tca	28.80	8.06	0.28	8.03	22.7	95.1	6.9	0.62	282.5
79-OK-027-32-05	47-60	B24tsa	36.48	15.12	0.39	8.92	24.6	96.9	6.6	0.34	302.5
79-OK-027-32-06	60-75	B21tbsa	34.20	11.21	0.40	7.32	25.7	98.6	6.7	0.21	471.0
79-OK-027-32-07	75-87	B22tb	17.48	18.62	0.35	5.55	18.3	97.6	7.0	0.23	431.0
79-OK-027-32-08	87-104	BCb	18.05	23.67	0.44	6.22	23.8	97.9	7.0	0.19	484.5
Kirkland: 3											
81-OK-027-39-01	0-9	AP	6.03	3.73	0.20	0.25	10.7	65.8	5.4	1.79	---
81-OK-027-39-02	9-11	A2	7.83	5.06	0.16	0.61	12.9	77.3	6.1	1.44	---
81-OK-027-39-03	11-25	B21t	16.96	13.95	0.39	2.49	23.7	87.4	7.1	1.58	---
81-OK-027-39-04	25-36	B22tca	16.90	13.61	0.34	3.76	23.8	96.5	7.8	1.58	---
81-OK-027-39-05	36-49	B23tca	17.39	12.60	0.34	3.83	22.5	99.1	7.8	0.59	---
81-OK-027-39-06	49-58	B24t	13.09	10.39	0.32	3.27	19.4	95.8	7.8	0.39	---
81-OK-027-39-07	58-76	B31	10.73	9.22	0.38	3.21	11.0	94.3	7.6	0.33	---
81-OK-027-39-08	76-86	B32	10.22	19.28	0.39	2.95	8.6	97.6	7.6	0.32	---
Dougherty: 4											
78-OK-027-31-01	0-7	A1	3.38	1.18	0.23	0.13	4.9	74.2	6.8	1.16	96.3
78-OK-027-31-02	7-15	A21	1.87	0.48	0.13	0.13	2.5	69.7	7.0	0.55	49.7
78-OK-027-31-03	15-23	A22	1.85	0.76	0.13	0.13	2.8	71.6	6.4	0.38	53.6
78-OK-027-31-04	23-27	B21t	4.07	2.52	0.31	0.13	9.7	59.3	5.4	0.86	119.1
78-OK-027-31-05	27-39	B22t	4.87	3.02	0.23	0.13	12.7	55.8	5.2	0.82	107.2
78-OK-027-31-06	39-65	B3	4.24	2.79	0.23	0.17	10.2	63.6	5.5	0.46	79.4
78-OK-027-31-07	65-96	C	2.67	1.72	0.15	0.13	4.6	76.7	5.8	0.23	39.7
Harrah: 5											
78-OK-027-31-01	0-5	A1	2.91	0.99	0.25	0.06	9.3	61.4	6.4	1.17	128.8
78-OK-027-31-02	5-13	A21	1.57	0.63	0.10	0.05	7.7	54.2	6.8	0.53	111.5
78-OK-027-31-03	13-25	A22	0.99	0.58	0.05	0.06	7.8	51.4	6.5	0.27	83.0
78-OK-027-31-04	25-35	B21t	2.82	1.70	0.29	0.05	11.7	56.8	5.3	0.28	117.3
78-OK-027-31-05	35-57	B22t	2.69	2.11	0.28	0.05	12.5	60.8	5.4	0.21	111.5
78-OK-027-31-06	57-70	B21tb	3.54	2.46	0.32	0.06	11.4	65.0	5.6	0.17	117.3
78-OK-027-31-07	70-85	B22tb	3.63	3.23	0.23	0.07	9.8	69.3	5.8	0.19	123.0
78-OK-027-31-08	85-96	B3b	3.36	3.00	0.20	0.07	8.5	69.5	5.5	0.16	128.8
Littleaxe: 6											
74-OK-027-2-01	0-7	A1	2.75	1.07	0.10	0.09	4.0	70.2	6.6	1.31	63.5
74-OK-027-2-02	7-16	A2	0.69	0.48	0.10	0.09	1.5	70.6	6.5	0.18	39.7
74-OK-027-2-03	16-28	B21t	2.67	4.12	0.41	0.10	11.4	53.9	5.1	0.48	81.4
74-OK-027-2-04	28-37	B22t	2.81	4.41	0.28	0.10	11.2	59.8	5.1	0.35	75.4
74-OK-027-2-05	37-43	B31	2.14	3.40	0.21	0.10	7.7	65.1	5.3	0.23	63.5
74-OK-027-2-06	43-52	B32	1.74	2.54	0.15	0.10	6.4	61.5	5.4	0.13	64.5
74-OK-027-2-07	52-60	Cr	2.12	3.44	0.18	0.10	---	63.2	5.2	0.12	64.5

See footnotes at end of table.

Supplement to the Soil Survey of Cleveland County, Oklahoma

Table 6.--Chemical Properties of Selected Soils

Soil series and sample number	Depth	Horizon	Extractable bases				Cation exchange capacity	Base saturation	Reaction 1:1	Organic matter	Total P							
			Ca	Mg	K	Na												
<i>In</i>																		
-----meq/100 g-----																		
Newalla: 7																		
80-OK-027-36-01	0-6	A1	1.96	0.67	0.15	0.03	5.6	41.2	5.7	1.56	---							
80-OK-027-36-02	6-9	A2	0.59	0.65	0.07	0.04	3.2	29.3	5.4	0.55	---							
80-OK-027-36-03	9-13	B2t	0.71	1.31	0.11	0.04	5.8	34.8	5.1	0.46	---							
80-OK-027-36-04	13-28	IIB21t	2.97	3.13	0.23	0.12	22.3	34.5	5.0	0.59	---							
80-OK-027-36-05	28-36	IIB22t	3.50	5.25	0.23	0.51	15.5	56.5	4.7	0.44	---							
80-OK-027-36-06	36-48	IIB3	4.78	6.57	0.18	1.16	16.2	76.0	5.5	0.41	---							
80-OK-027-36-07	48-56	IICr	6.74	9.08	0.45	2.42	21.9	93.2	6.7	0.34	---							
Newalla: 8																		
80-OK-027-37-01	0-3	A1	4.92	2.53	0.34	0.05	12.4	40.1	5.3	3.69	---							
80-OK-027-37-02	3-6	A2	0.87	1.63	0.21	0.04	5.4	28.8	5.0	1.84	---							
80-OK-027-37-03	6-10	B2t	3.75	4.57	0.39	0.08	13.7	48.1	4.9	1.29	---							
80-OK-027-37-04	10-16	IIB21t	10.22	9.81	0.35	0.29	25.2	75.3	4.8	1.18	---							
80-OK-027-37-05	16-30	IIB22t	11.99	11.45	0.29	0.51	25.8	85.6	6.0	0.93	---							
80-OK-027-37-06	30-42	IIB23tca	27.27	14.34	0.27	1.08	24.3	96.9	7.8	0.46	---							
80-OK-027-37-07	42-51	IIB24t	13.39	19.57	0.35	1.68	26.3	97.5	7.8	0.31	---							
80-OK-027-37-08	51-58	IIB3	14.01	19.78	0.33	2.12	31.0	99.3	7.3	0.10	---							
80-OK-027-37-09	58-80	IICr	13.99	18.97	0.39	1.85	29.8	99.4	7.3	0.12	---							
Pawhuska: 9																		
79-OK-027-33-01	0-10	A1	6.92	4.71	0.80	0.22	21.2	63.1	6.3	3.02	431.0							
79-OK-027-33-02	10-19	B21t	17.06	3.46	0.40	3.88	26.2	80.6	7.1	1.37	353.0							
79-OK-027-33-03	19-26	B22t	20.25	23.83	0.28	7.72	23.0	93.9	8.4	0.87	340.3							
79-OK-027-33-04	26-33	B23tca	22.88	38.76	0.27	9.64	22.1	99.3	8.4	0.66	302.5							
79-OK-027-33-05	33-43	B24tsa	47.58	20.83	0.30	11.34	21.8	98.4	7.9	0.43	229.0							
79-OK-027-33-06	43-57	B3sa	56.24	12.16	0.30	10.69	22.3	98.3	7.9	0.33	302.5							
79-OK-027-33-07	57-65	B21tb	45.68	14.33	0.33	8.06	23.7	96.1	7.6	0.24	105.5							
79-OK-027-33-08	65-87	B22tcab	42.64	9.04	0.27	6.22	18.9	98.8	8.0	0.22	194.5							
79-OK-027-33-09	87-99	BCb	19.23	3.57	0.34	6.33	20.9	94.4	8.4	0.31	242.5							
Pawhuska: 10																		
79-OK-027-34-01	0-3	A11P	5.66	8.02	0.26	4.76	15.4	91.2	7.3	0.76	327.5							
79-OK-027-34-02	3-6	A12P	5.74	7.18	0.16	5.41	15.4	93.5	7.8	0.76	229.0							
79-OK-027-34-03	6-20	B21t	10.45	15.7	0.28	12.59	31.5	95.9	7.7	0.76	277.5							
79-OK-027-34-04	20-28	B22t	41.42	9.69	0.40	13.69	28.2	99.6	7.9	0.40	217.0							
Pawhuska: 11																		
79-OK-027-35-01	0-10	A1	5.32	4.48	0.43	0.41	13.5	72.2	8.0	2.64	230.0							
79-OK-027-35-02	10-17	B21t	6.46	12.54	0.39	5.99	23.5	79.8	7.8	1.96	205.0							
79-OK-027-35-03	17-24	B22t	5.17	16.87	0.32	11.85	23.5	88.1	8.4	0.82	169.5							
79-OK-027-35-04	24-40	23tsa	37.81	23.75	0.27	11.66	20.2	96.0	7.7	0.42	132.3							
79-OK-027-35-05	40-54	31sa	25.27	11.40	0.29	8.58	17.9	96.7	7.6	0.31	153.0							
79-OK-027-35-06	54-70	B32	10.64	9.88	0.29	5.48	16.4	94.9	7.6	0.11	164.5							

¹ Darsil loamy fine sand: About 700 feet east and 50 feet south of the northeast corner of sec. 32, T. 9 N., R. 3 W. This pedon is in an area of Stephenville-Darsil-Newalla complex, 3 to 8 percent slopes. The data represents a typical pedon of Darsil loamy fine sand.

² Kirkland silt loam: About 1,470 feet south and 1,050 feet west of the northeast corner of sec. 33, T. 10 N., R. 3 W. This pedon is in an area of Kirkland-Pawhuska complex, 0 to 3 percent slopes. The data represents a typical pedon of Kirkland silt loam.

³ Kirkland silt loam: About 2,150 feet south and 150 feet west of the northeast corner of sec. 21, T. 10 N., R. 3 W. This pedon is in an area of Kirkland silt loam, 0 to 1 percent slopes.

⁴ Dougherty loamy fine sand: About 1,600 feet east and 100 feet north of the southwest corner of sec. 17, T. 7 N., R. 1 W. This pedon is in an area of Dougherty-Konawa complex, 2 to 8 percent slopes. The data represents a typical pedon of Dougherty loamy fine sand.

⁵ Harrah fine sandy loam: About 2,600 feet north and 2,200 feet west of the southeast corner of sec. 24, T. 10 N., R. 1 W. The data represents a typical pedon of Harrah fine sandy loam, 3 to 8 percent slopes. The thickness of the A2 horizon is the maximum allowed in the definition of the series.

Supplement to the Soil Survey of Cleveland County, Oklahoma

⁶ Littleaxe loamy fine sand: About 2,120 feet west and 380 feet south of the northeast corner of sec. 6, T. 8 N., R. 1 E. The data represents a typical pedon of Littleaxe loamy fine sand, 1 to 3 percent slopes.

⁷ Newalla fine loamy sand: In a road cut about 1,900 feet east of the southwest corner of sec. 23, T. 9 N., R. 1 E. This pedon is in an area of Stephenville-Darsil-Newalla complex, 3 to 8 percent slopes. Other than being too acid in the IIB21t and IIB22t horizons, the data represents a typical pedon of Newalla fine sandy loam.

⁸ Newalla fine sandy loam: About 1,900 feet east and 150 feet south of the northwest corner of sec. 21, T. 7 N., R. 1 E. This pedon is in an area of Stephenville-Darsil-Newalla complex, 3 to 8 percent slopes. The data represents a typical pedon of Newalla fine sandy loam.

⁹ Pawhuska silt loam: About 1,440 feet south and 1,500 feet west of the northeast corner of sec. 33, T. 10 N., R. 3 W. This pedon is in an area of Kirkland-Pawhuska complex, 0 to 3 percent slopes. The data represents a typical pedon of Pawhuska silt loam.

¹⁰ Pawhuska silt loam: About 2,050 feet west and 120 feet south of the northeast corner of sec. 33, T. 10 N., R. 3 W. This pedon is in an area of Kirkland-Pawhuska complex, 0 to 3 percent slopes, eroded. The data represents the upper pedon of Pawhuska silt loam. This eroded pedon was sampled for comparison to the noneroded pedon data shown in sample number 79-OK-27-33.

¹¹ Pawhuska silt loam: About 50 feet east and 300 feet south of the northwest corner of sec. 17, T. 10 N., R. 3 W. This pedon is in an area of Grant-Huska complex, 1 to 5 percent slopes. The data is not representative of the Pawhuska series because of the decrease in clay content in the lower horizons. The data would be representative of the Huska series if bedrock had been encountered at a depth of 40 to 60 inches.

Formation and Classification of the Soils

This section summarizes the major factors of soil formation and describes the system of soil classification. The classification of each soil in the survey area is shown in the table "Classification of the Soils" at the end of this section. The Official Soil Series Descriptions, including the range of important characteristics of the soils, for the series in this survey area are online at <http://soils.usda.gov/technical/classification/osd/>. Characteristics of the soil and the material in which it formed are identified for each soil series. A pedon, a small three-dimensional area of soil, which is typical of the series is described. The detailed description of each soil horizon follows standards in the "Soil Survey Manual" (Soil Survey Division Staff, 1993). Many of the technical terms used in the descriptions are defined in "Soil Taxonomy" (Soil Survey Staff, 1999).

Formation of the Soils

Soil is produced by the action of soil-forming processes on materials deposited or accumulated by geologic agencies. The characteristics of the soil at any given point are determined by the physical and mineralogical composition of the parent materials; the climate under which the soil material has accumulated and existed since accumulation; the plant and animal life on and in the soil; the relief, or lay of the land; and the length of time the forces of soil development have acted on the soil material.

Climate and vegetation are the active factors of soil formation. They act on parent material that has accumulated through the weathering of rocks and slowly change it into a natural body that has genetically related horizons. The effects of climate and vegetation are conditioned by relief. Parent material also affects the kind of profile that can be formed and, in extreme cases, determines it almost entirely. Finally, time is needed for the changing of the parent material into a soil profile. The time may be long or short, but some time is always required for differentiation of horizons. Generally, a long time is required for the development of distinct horizons.

Climate

Cleveland County has a moist, subhumid climate. The climate is fairly uniform throughout the county. Differences between the soils cannot be attributed to differences in climate based on the present climatic regime. The amount of moisture and the temperatures have been sufficient to promote the formation of distinct layers in many of the soils. Soil leaching is moderate. The physical abrasion and redistribution of materials by wind action contributes to soil formation. Cold temperatures occur often enough and long enough for freezing and thawing to alter soil materials.

Living Organisms

Plants, burrowing animals, insects, and microorganisms in the soil have a direct influence on the formation of soils. The native grasses and trees in the

county have had different effects on the losses and gains of organic matter and plant nutrients and on soil structure and porosity. Soils that formed under prairie vegetation, such as Kirkland soils, have a dark grayish brown surface layer and a moderately high content of organic matter. Soils that formed under trees, such as Harrah and Stephenville soils, have a brown surface layer and a low content of organic matter.

Topography

Relief influences the formation of soils mainly by affecting erosion, movement of water, soil temperature, and plant cover. In Cleveland County, relief is determined largely by the resistance of underlying formations to weathering and geological erosion. The southern third of the county has rolling to hilly uplands with long, narrow, very gently sloping to moderately sloping summits. The drainage deeply dissects the uplands, forming broad, gently sloping to steep side slopes and narrow flood plains. The native vegetation is prairie and post oak and blackjack oak savannah with an understory of tall and mid grasses. The northern third of the county has nearly level to rolling uplands with broad, nearly level and very gently sloping summits. The native vegetation is mid- and tall-grass prairie.

Parent Material

Parent material is the unconsolidated material in which soil forms. It is one of the major factors affecting soil formation in Cleveland County. Parent material establishes the limits of the physical properties and chemical and mineral composition of the soil, and it influences the rate of soil development.

The soils on uplands in the county formed in parent materials weathered from sandstone, siltstone, shale, alluvial and colluvial mantle sediments, and eolian deposits. Darsil, Littleaxe, and Stephenville soils formed in material weathered from acid sandstone. Grant, Kingfisher, and Ironmound soils formed in material weathered from alkaline sandstone or siltstone. Grainola, Newalla, and Renfrow soils formed in material weathered from alkaline shale. Norge, Teller, and Vanoss soils formed in loamy mantle alluvial sediments, and Bethany, Kirkland, and Pawhuska soils formed in clayey mantel alluvial sediments. Harrah soils formed in loamy colluvial sediments predominantly from sandstone.

In many areas, the mantled upland soils and colluvial soils have buried horizons within a depth of 3 to 5 feet. These buried horizons are commonly more clayey than the soil material above but are similar in color or slightly darker. They formed in older materials from a previous depositional period.

Eolian sediments and wind-reworked alluvial sediments are common on the uplands paralleling the South Canadian River. Derby and Goodnight soils formed in sandy eolian sediments that were mostly deposited as large dunes. Dougherty, Konawa, and Slaughterville soils formed in wind-reworked alluvial sediment.

Alluvial sediments are extensive along the South Canadian River, the Little River, and the many tributaries throughout the county. The sediments that deposited and the soils that formed depended largely on the source of sediment and the velocity of the floodwater. Asher, Ashport, Canadian, Gracemont, Keokuk, and Port soils formed in loamy sediment deposited by fast-moving water near the South Canadian River. Pulaski and Tribbey soils formed in loamy and sandy sediments deposited on low flood plains along small streams in the eastern part of the county. Brewless and Lomill soils formed in clayey and loamy alluvium deposited by slow-moving water on high flood plains along major steams.

Time

As a factor in soil formation, time is not measured strictly in years. The length of time needed for the development of genetic horizons depends on the intensity and interactions of soil-forming factors. Losses, gains, transfers, or transformations of constituent materials are necessary for the formation of soil horizons. Soils that have approached equilibrium with their environment are designated as mature or older and tend to have well defined horizons. Soils that have no definite genetic horizons are designated as young or immature.

The soils in Cleveland County range from young to old. Bethany and Renfrow soils are examples of old soils. Kingfisher and Teller soils are younger, but they have well expressed horizons. Darsil and Ironmound soils are considered young soils. They have had sufficient time to develop well expressed horizons; because they are sloping, however, geological erosion has taken away soil material almost as fast it formed. Ashport and Pulaski soils are young soils that formed in recent sediments on flood plains and show little horizon development.

Classification of the Soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (Soil Survey Staff, 1999 and 2003). Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. The categories are described in the following paragraphs.

ORDER. Twelve soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in *sol*. An example is Mollisol.

SUBORDER. Each order is divided into suborders primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Ustoll (*Ust*, meaning dry, plus *oll*, from Mollisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Argiustolls (*Argi*, meaning argilllic horizonation, plus *ustoll*, the suborder of the Mollisols that has an ustic moisture regime).

SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other known kind of soil. Each subgroup is identified by one or more adjectives preceding the name of the great group. An example is Udic Argiustolls.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Generally, the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle-size class, mineral content, temperature regime, thickness of the root zone, consistence, moisture equivalent, slope, and permanent cracks. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is fine-loamy, siliceous, active, thermic Udic Argiustolls.

Supplement to the Soil Survey of Cleveland County, Oklahoma

SERIES. The series consists of soils that have similar horizons in their profile. The horizons are similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile. The texture of the surface layer or of the substratum can differ within a series.

Table 7.--Classification of the Soils

Soil name	Family or higher taxonomic class
Asher-----	Fine-silty, mixed, superactive, thermic Fluventic Haplustolls
Ashport-----	Fine-silty, mixed, superactive, thermic Fluventic Haplustolls
Bethany-----	Fine, mixed, superactive, thermic Pachic Paleustolls
Brewless-----	Fine, mixed, superactive, thermic Udertic Argiustolls
Canadian-----	Coarse-loamy, mixed, superactive, thermic Udic Haplustolls
Carwile-----	Fine, mixed, superactive, thermic Typic Argiaquolls
Darnell-----	Loamy, siliceous, active, thermic, shallow Udic Haplustepts
Darsil-----	Thermic, shallow, coated Ustic Quartzipsammments
Derby-----	Mixed, thermic Lamellic Ustipsammments
Dougherty-----	Loamy, mixed, active, thermic Arenic Haplustalfs
Easpur-----	Fine-loamy, mixed, superactive, thermic Fluventic Haplustolls
Ezell-----	Sandy, mixed, thermic Aeric Fluvaquents
Gaddy-----	Sandy, mixed, thermic Udic Ustifluvents
Goodnight-----	Mixed, thermic Typic Ustipsammments
Gracemont-----	Coarse-loamy, mixed, superactive, calcareous, thermic Oxyaquic Udifluvents
Gracemore-----	Sandy, mixed, thermic Oxyaquic Udifluvents
Grainola-----	Fine, mixed, active, thermic Udertic Haplustalfs
Grant-----	Fine-silty, mixed, superactive, thermic Udic Argiustolls
Harrah-----	Fine-loamy, siliceous, active, thermic Ultic Paleustalfs
Huska-----	Fine, mixed, superactive, thermic Mollic Natrustalfs
Ironmound-----	Loamy, mixed, active, thermic, shallow Udic Haplustepts
Keokuk-----	Coarse-silty, mixed, superactive, thermic Fluventic Haplustolls
Kingfisher-----	Fine-silty, mixed, active, thermic Udic Argiustolls
Kirkland-----	Fine, mixed, superactive, thermic Udertic Paleustolls
Konawa-----	Fine-loamy, mixed, active, thermic Ultic Haplustalfs
Lebron-----	Clayey over sandy or sandy-skeletal, mixed, superactive, thermic Fluvaquentic Hapludolls
Littleaxe-----	Fine-loamy, siliceous, active, thermic Ultic Haplustalfs
Lomill-----	Clayey over loamy, mixed, superactive, thermic Udertic Haplustolls
Miller-----	Fine, mixed, superactive, thermic Udertic Haplustolls
Minco-----	Coarse-silty, mixed, superactive, thermic Udic Haplustolls
Newalla-----	Fine-loamy over clayey, siliceous, superactive, thermic Udic Haplustalfs
Norge-----	Fine-silty, mixed, active, thermic Udic Paleustolls
Pawhuska-----	Fine, mixed, superactive, thermic Mollic Natrustalfs
Piedmont-----	Fine, mixed, superactive, thermic Udertic Argiustolls
Port-----	Fine-silty, mixed, superactive, thermic Cumulic Haplustolls
Pulaski-----	Coarse-loamy, mixed, superactive, nonacid, thermic Udic Ustifluvents
Reinach-----	Coarse-silty, mixed, superactive, thermic Pachic Haplustolls
Renfrow-----	Fine, mixed, superactive, thermic Udertic Paleustolls
Slaughterville-----	Coarse-loamy, mixed, superactive, thermic Udic Haplustolls
Stephenville-----	Fine-loamy, siliceous, active, thermic Ultic Haplustalfs
Teller-----	Fine-loamy, mixed, active, thermic Udic Argiustolls
Teval-----	Fine-loamy, mixed, active, thermic Udic Argiustolls
Tribbey-----	Coarse-loamy, mixed, superactive, nonacid, thermic Oxyaquic Udifluvents
Vanoss-----	Fine-silty, mixed, superactive, thermic Udic Argiustolls
Yahola-----	Coarse-loamy, mixed, superactive, calcareous, thermic Udic Ustifluvents

References

Cleveland County Historical Society. 1973. Pioneers and early settlers of Cleveland County, Oklahoma, 1889-1925.

Fenneman, N.M. 1930. Physiographic divisions of the United States. U.S. Geological Survey Map.

Johnson, Robert K. 1958. Subsurface geology of northeast Cleveland County, Oklahoma, volume 9, number 2.

Norman Chamber of Commerce. April 1983. Norman manufacturers guide.

Soil Survey Division Staff. 1993. Soil survey manual. Soil Conservation Service. U.S. Department of Agriculture Handbook 18. <http://soils.usda.gov/technical/>

Soil Survey Staff. 1999. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. 2nd edition. Natural Resources Conservation Service. U.S. Department of Agriculture Handbook 436. <http://soils.usda.gov/technical/>

Soil Survey Staff. 2003. Keys to soil taxonomy. 9th edition. U.S. Department of Agriculture, Natural Resources Conservation Service. <http://soils.usda.gov/technical/>

United States Department of Agriculture. 1987. Soil survey of Cleveland County, Oklahoma.

United States Department of Agriculture, Natural Resources Conservation Service. 1996. Soil survey laboratory methods manual. Soil Survey Investigations Report 42

Wood, P.R., and L.C. Burton. 1968. Ground-water resources in Cleveland and Oklahoma Counties. Oklahoma Geological Survey Circular 71.

Glossary

Many of the terms relating to landforms, geology, and geomorphology are defined in more detail in the "National Soil Survey Handbook" (available at local offices of the Natural Resources Conservation Service or on the Internet).

ABC soil. A soil having an A, a B, and a C horizon.

AC soil. A soil having only an A and a C horizon. Commonly, such soil formed in recent alluvium or on steep, rocky slopes.

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alkali (sodic) soil. A soil having so high a degree of alkalinity (pH 8.5 or higher) or so high a percentage of exchangeable sodium (15 percent or more of the total exchangeable bases), or both, that plant growth is restricted.

Alluvial fan. A low, outspread mass of loose materials and/or rock material, commonly with gentle slopes. It is shaped like an open fan or a segment of a cone. The material was deposited by a stream at the place where it issues from a narrow mountain valley or upland valley or where a tributary stream is near or at its junction with the main stream. The fan is steepest near its apex, which points upstream, and slopes gently and convexly outward (downstream) with a gradual decrease in gradient.

Alluvium. Unconsolidated material, such as gravel, sand, silt, clay, and various mixtures of these, deposited on land by running water.

Alpha,alpha-dipyridyl. A compound that when dissolved in ammonium acetate is used to detect the presence of reduced iron (Fe II) in the soil. A positive reaction implies reducing conditions and the likely presence of redoximorphic features.

Animal unit month (AUM). The amount of forage required by one mature cow of approximately 1,000 pounds weight, with or without a calf, for 1 month.

Aquic conditions. Current soil wetness characterized by saturation, reduction, and redoximorphic features.

Argillic horizon. A subsoil horizon characterized by an accumulation of illuvial clay.

Aspect. The direction toward which a slope faces. Also called slope aspect.

Association, soil. A group of soils or miscellaneous areas geographically associated in a characteristic repeating pattern and defined and delineated as a single map unit.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as:

Very low	0 to 3
Low	3 to 6
Moderate	6 to 9
High	9 to 12
Very high	more than 12

Backslope. The position that forms the steepest and generally linear, middle portion of a hillslope. In profile, backslopes are commonly bounded by a convex shoulder above and a concave footslope below.

Backswamp. A flood-plain landform. Extensive, marshy or swampy, depressed areas of flood plains between natural levees and valley sides or terraces.

Badland. A landscape that is intricately dissected and characterized by a very fine drainage network with high drainage densities and short, steep slopes and narrow interfluves. Badlands develop on surfaces that have little or no vegetative cover overlying unconsolidated or poorly cemented materials (clays, silts, or sandstones) with, in some cases, soluble minerals, such as gypsum or halite.

Basal area. The area of a cross section of a tree, generally referring to the section at breast height and measured outside the bark. It is a measure of stand density, commonly expressed in square feet.

Base saturation. The degree to which material having cation-exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, and K), expressed as a percentage of the total cation-exchange capacity.

Base slope (geomorphology). A geomorphic component of hills consisting of the concave to linear (perpendicular to the contour) slope that, regardless of the lateral shape, forms an apron or wedge at the bottom of a hillside dominated by colluvium and slope-wash sediments (for example, slope alluvium).

Bedding plane. A planar or nearly planar bedding surface that visibly separates each successive layer of stratified sediment or rock (of the same or different lithology) from the preceding or following layer; a plane of deposition. It commonly marks a change in the circumstances of deposition and may show a parting, a color difference, a change in particle size, or various combinations of these. The term is commonly applied to any bedding surface, even one that is conspicuously bent or deformed by folding.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bedrock-controlled topography. A landscape where the configuration and relief of the landforms are determined or strongly influenced by the underlying bedrock.

Bisequum. Two sequences of soil horizons, each of which consists of an illuvial horizon and the overlying eluvial horizons.

Blowout. A saucer-, cup-, or trough-shaped depression formed by wind erosion on a preexisting dune or other sand deposit, especially in an area of shifting sand or loose soil or where protective vegetation is disturbed or destroyed; the adjoining accumulation of sand derived from the depression, where recognizable, is commonly included. Blowouts are commonly small.

Bottom land. An informal term loosely applied to various portions of a flood plain.

Boulders. Rock fragments larger than 2 feet (60 centimeters) in diameter.

Breaks. A landscape or tract of steep, rough or broken land dissected by ravines and gullies and marking a sudden change in topography.

Breast height. An average height of 4.5 feet above the ground surface; the point on a tree where diameter measurements are ordinarily taken.

Brush management. Use of mechanical, chemical, or biological methods to make conditions favorable for reseeding or to reduce or eliminate competition from woody vegetation and thus allow understory grasses and forbs to recover. Brush management increases forage production and thus reduces the hazard of erosion. It can improve the habitat for some species of wildlife.

Butte. An isolated, generally flat-topped hill or mountain with relatively steep slopes and talus or precipitous cliffs and characterized by summit width that is less than the height of bounding escarpments; commonly topped by a caprock of resistant material and representing an erosion remnant carved from flat-lying rocks.

Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

Caliche. A general term for a prominent zone of secondary carbonate accumulation in surficial materials in warm, subhumid to arid areas. Caliche is formed by both geologic and pedologic processes. Finely crystalline calcium carbonate forms a nearly continuous surface-coating and void-filling medium in geologic (parent) materials. Cementation ranges from weak in nonindurated forms to very strong in indurated forms. Other minerals (e.g., carbonates, silicate, and sulfate) may occur as accessory cements. Most petrocalcic horizons and some calcic horizons are caliche.

Canopy. The leafy crown of trees or shrubs. (See Crown.)

Canyon. A long, deep, narrow valley with high, precipitous walls in an area of high local relief.

Capillary water. Water held as a film around soil particles and in tiny spaces between particles. Surface tension is the adhesive force that holds capillary water in the soil.

Catena. A sequence, or "chain," of soils on a landscape that formed in similar kinds of parent material and under similar climatic conditions but that have different characteristics as a result of differences in relief and drainage.

Cation. An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.

Cation-exchange capacity. The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity but is more precise in meaning.

Catsteps. See Terracettes.

Channery soil material. Soil material that has, by volume, 15 to 35 percent thin, flat fragments of sandstone, shale, slate, limestone, or schist as much as 6 inches (15 centimeters) along the longest axis. A single piece is called a channer.

Chemical treatment. Control of unwanted vegetation through the use of chemicals.

Chiseling. Tillage with an implement having one or more soil-penetrating points that shatter or loosen hard, compacted layers to a depth below normal plow depth.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay depletions. See Redoximorphic features.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Clay beds. Old, buried, alluvial clay sediments.

Claypan. A dense, compact, slowly permeable subsoil layer that contains much more clay than the overlying materials, from which it is separated by a sharply defined boundary. A claypan is commonly hard when dry and plastic and sticky when wet.

Climax plant community. The stabilized plant community on a particular site. The plant cover reproduces itself and does not change so long as the environment remains the same.

Coarse fragments. Mineral or rock particles larger than 2 millimeters in diameter.

Coarse textured soil. Sand or loamy sand.

Cobble (or cobblestone). A rounded or partly rounded fragment of rock 3 to 10 inches (7.6 to 25 centimeters) in diameter.

Cobbly soil material. Material that has 15 to 35 percent, by volume, rounded or partially rounded rock fragments 3 to 10 inches (7.6 to 25 centimeters) in diameter. Very cobbly soil material has 35 to 60 percent of these rock fragments, and extremely cobbly soil material has more than 60 percent.

COLE (coefficient of linear extensibility). See Linear extensibility.

Colluvium. Unconsolidated, unsorted earth material being transported or deposited on side slopes and/or at the base of slopes by mass movement (e.g., direct gravitational action) and by local, unconcentrated runoff.

Complex slope. Irregular or variable slope. Planning or establishing terraces, diversions, and other water-control structures on a complex slope is difficult.

Complex, soil. A map unit of two or more kinds of soil or miscellaneous areas in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas.

Concretions. See Redoximorphic features.

Conglomerate. A coarse grained, clastic sedimentary rock composed of rounded or subangular rock fragments more than 2 millimeters in diameter. It commonly has a matrix of sand and finer textured material. Conglomerate is the consolidated equivalent of gravel.

Conservation cropping system. Growing crops in combination with needed cultural and management practices. In a good conservation cropping system, the soil-improving crops and practices more than offset the effects of the soil-depleting crops and practices. Cropping systems are needed on all tilled soils. Soil-improving practices in a conservation cropping system include the use of rotations that contain grasses and legumes and the return of crop residue to the soil. Other practices include the use of green manure crops of grasses and legumes, proper tillage, adequate fertilization, and weed and pest control.

Conservation tillage. A tillage system that does not invert the soil and that leaves a protective amount of crop residue on the surface throughout the year.

Consistence, soil. Refers to the degree of cohesion and adhesion of soil material and its resistance to deformation when ruptured. Consistence includes resistance of soil material to rupture and to penetration; plasticity, toughness, and stickiness of puddled soil material; and the manner in which the soil material behaves when subject to compression. Terms describing consistence are defined in the "Soil Survey Manual."

Contour stripcropping. Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Coprogenous earth (sedimentary peat). A type of limnic layer composed predominantly of fecal material derived from aquatic animals.

Corrosion (geomorphology). A process of erosion whereby rocks and soil are removed or worn away by natural chemical processes, especially by the solvent action of running water, but also by other reactions, such as hydrolysis, hydration, carbonation, and oxidation.

Corrosion (soil survey interpretations). Soil-induced electrochemical or chemical action that dissolves or weakens concrete or uncoated steel.

Cover crop. A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Crop residue management. Returning crop residue to the soil, which helps to maintain soil structure, organic matter content, and fertility and helps to control erosion.

Cropping system. Growing crops according to a planned system of rotation and management practices.

Cross-slope farming. Deliberately conducting farming operations on sloping farmland in such a way that tillage is across the general slope.

Crown. The upper part of a tree or shrub, including the living branches and their foliage.

Cuesta. An asymmetric ridge capped by resistant rock layers of slight or moderate dip (commonly less than 15 percent slopes); a type of homoclinal produced by differential erosion of interbedded resistant and weak rocks. A cuesta has a long, gentle slope on one side (dip slope) that roughly parallels the inclined beds; on the other side, it has a relatively short and steep or clifflike slope (scarp) that cuts through the tilted rocks.

Decreasers. The most heavily grazed climax range plants. Because they are the most palatable, they are the first to be destroyed by overgrazing.

Deferred grazing. Postponing grazing or resting grazing land for a prescribed period.

Deflocculation. Dispersion, or breaking up, of soil aggregates into individual particles. Sodium salts, for example, deflocculate, or disperse, granulated particles of clay to form a clay that runs together, or puddles.

Depth, soil. Generally, the thickness of the soil over bedrock. Very deep soils are more than 60 inches deep over bedrock; deep soils, 40 to 60 inches; moderately deep, 20 to 40 inches; shallow, 10 to 20 inches; and very shallow, less than 10 inches.

Diatomaceous earth. A geologic deposit of fine, grayish siliceous material composed chiefly or entirely of the remains of diatoms.

Dip slope. A slope of the land surface, roughly determined by and approximately conforming to the dip of the underlying bedrock.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Drainage class (natural). Refers to the frequency and duration of wet periods under conditions similar to those under which the soil formed. Alterations of the water regime by human activities, either through drainage or irrigation, are not a consideration unless they have significantly changed the morphology of the soil. Seven classes of natural soil drainage are recognized—*excessively drained, somewhat excessively drained, well drained, moderately well drained, somewhat poorly drained, poorly drained, and very poorly drained*. These classes are defined in the “Soil Survey Manual.”

Drainage, surface. Runoff, or surface flow of water, from an area.

Drainageway. A general term for a course or channel along which water moves in draining an area. A term restricted to relatively small, linear depressions that at some time move concentrated water and either do not have a defined channel or have only a small defined channel.

Draw. A small stream valley that generally is shallower and more open than a ravine or gulch and that has a broader bottom. The present stream channel may appear inadequate to have cut the drainageway that it occupies.

Duff. A generally firm organic layer on the surface of mineral soils. It consists of fallen plant material that is in the process of decomposition and includes everything from the litter on the surface to underlying pure humus.

Dune. A low mound, ridge, bank, or hill of loose, windblown granular material (generally sand), either barren and capable of movement from place to place or covered and stabilized with vegetation but retaining its characteristic shape.

Earthy fill. See Mine spoil.

Ecological site. An area where climate, soil, and relief are sufficiently uniform to produce a distinct natural plant community. An ecological site is the product of all the environmental factors responsible for its development. It is typified by an

association of species that differ from those on other ecological sites in kind and/or proportion of species or in total production.

Eluviation. The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.

Endosaturation. A type of saturation of the soil in which all horizons between the upper boundary of saturation and a depth of 2 meters are saturated.

Eolian deposit. Sand-, silt-, or clay-sized clastic material transported and deposited primarily by wind, commonly in the form of a dune or a sheet of sand or loess.

Ephemeral stream. A stream, or reach of a stream, that flows only in direct response to precipitation. It receives no long-continued supply from melting snow or other source, and its channel is above the water table at all times.

Episaturation. A type of saturation indicating a perched water table in a soil in which saturated layers are underlain by one or more unsaturated layers within 2 meters of the surface.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains.

Synonym: natural erosion.

Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of human or animal activities or of a catastrophe in nature, such as a fire, that exposes the surface.

Erosion surface. A land surface shaped by the action of erosion, especially by running water.

Escarpment. A relatively continuous and steep slope or cliff breaking the general continuity of more gently sloping land surfaces and resulting from erosion or faulting. Most commonly applied to cliffs produced by differential erosion.

Synonym: scarp.

Fallow. Cropland left idle in order to restore productivity through accumulation of moisture. Summer fallow is common in regions of limited rainfall where cereal grain is grown. The soil is tilled for at least one growing season for weed control and decomposition of plant residue.

Fan remnant. A general term for landforms that are the remaining parts of older fan landforms, such as alluvial fans, that have been either dissected or partially buried.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Field moisture capacity. The moisture content of a soil, expressed as a percentage of the oven-dry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity*, *normal moisture capacity*, or *capillary capacity*.

Fill slope. A sloping surface consisting of excavated soil material from a road cut. It commonly is on the downhill side of the road.

Fine textured soil. Sandy clay, silty clay, or clay.

Firebreak. An area cleared of flammable material to stop or help control creeping or running fires. It also serves as a line from which to work and to facilitate the movement of firefighters and equipment. Designated roads also serve as firebreaks.

First bottom. An obsolete, informal term loosely applied to the lowest flood-plain steps that are subject to regular flooding.

Flaggy soil material. Material that has, by volume, 15 to 35 percent flagstones. Very flaggy soil material has 35 to 60 percent flagstones, and extremely flaggy soil material has more than 60 percent flagstones.

Flagstone. A thin fragment of sandstone, limestone, slate, shale, or (rarely) schist 6 to 15 inches (15 to 38 centimeters) long.

Flood plain. The nearly level plain that borders a stream and is subject to flooding unless protected artificially.

Flood-plain landforms. A variety of constructional and erosional features produced by stream channel migration and flooding. Examples include backswamps, flood-plain splays, meanders, meander belts, meander scrolls, oxbow lakes, and natural levees.

Flood-plain splay. A fan-shaped deposit or other outspread deposit formed where an overloaded stream breaks through a levee (natural or artificial) and deposits its material (commonly coarse grained) on the flood plain.

Flood-plain step. An essentially flat, terrace-like alluvial surface within a valley that is frequently covered by floodwater from the present stream; any approximately horizontal surface still actively modified by fluvial scour and/or deposition. May occur individually or as a series of steps.

Fluvial. Of or pertaining to rivers or streams; produced by stream or river action.

Foothills. A region of steeply sloping hills that fringes a mountain range or high-plateau escarpment. The hills have relief of as much as 1,000 feet (300 meters).

Footslope. The concave surface at the base of a hillslope. A footslope is a transition zone between upslope sites of erosion and transport (shoulders and backslopes) and downslope sites of deposition (toeslopes).

Forb. Any herbaceous plant not a grass or a sedge.

Forest cover. All trees and other woody plants (underbrush) covering the ground in a forest.

Forest type. A stand of trees similar in composition and development because of given physical and biological factors by which it may be differentiated from other stands.

Fragipan. A loamy, brittle subsurface horizon low in porosity and content of organic matter and low or moderate in clay but high in silt or very fine sand. A fragipan appears cemented and restricts roots. When dry, it is hard or very hard and has a higher bulk density than the horizon or horizons above. When moist, it tends to rupture suddenly under pressure rather than to deform slowly.

Genesis, soil. The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

Gilgai. Commonly, a succession of microbasins and microknolls in nearly level areas or of microvalleys and microridges parallel with the slope. Typically, the microrelief of clayey soils that shrink and swell considerably with changes in moisture content.

Gleyed soil. Soil that formed under poor drainage, resulting in the reduction of iron and other elements in the profile and in gray colors.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock as much as 3 inches (2 millimeters to 7.6 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Material that has 15 to 35 percent, by volume, rounded or angular rock fragments, not prominently flattened, as much as 3 inches (7.6 centimeters) in diameter.

Green manure crop (agronomy). A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.

Ground water. Water filling all the unblocked pores of the material below the water table.

Gully. A small channel with steep sides caused by erosion and cut in unconsolidated materials by concentrated but intermittent flow of water. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

Hard bedrock. Bedrock that cannot be excavated except by blasting or by the use of special equipment that is not commonly used in construction.

Hardpan. A hardened or cemented soil horizon, or layer. The soil material is sandy, loamy, or clayey and is cemented by iron oxide, silica, calcium carbonate, or other substance.

Head slope (geomorphology). A geomorphic component of hills consisting of a laterally concave area of a hillside, especially at the head of a drainageway. The overland waterflow is converging.

High-residue crops. Such crops as small grain and corn used for grain. If properly managed, residue from these crops can be used to control erosion until the next crop in the rotation is established. These crops return large amounts of organic matter to the soil.

Hill. A generic term for an elevated area of the land surface, rising as much as 1,000 feet above surrounding lowlands, commonly of limited summit area and having a well defined outline. Slopes are generally more than 15 percent. The distinction between a hill and a mountain is arbitrary and may depend on local usage.

Hillslope. A generic term for the steeper part of a hill between its summit and the drainage line, valley flat, or depression floor at the base of a hill.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an uppercase letter represents the major horizons. Numbers or lowercase letters that follow represent subdivisions of the major horizons. An explanation of the subdivisions is given in the "Soil Survey Manual." The major horizons of mineral soil are as follows:

O horizon.—An organic layer of fresh and decaying plant residue.

A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon, most of which was originally part of a B horizon.

E horizon.—The mineral horizon in which the main feature is loss of silicate clay, iron, aluminum, or some combination of these.

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of transition from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics, such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) prismatic or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the overlying soil material. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, an Arabic numeral, commonly a 2, precedes the letter C.

Cr horizon.—Soft, consolidated bedrock beneath the soil.

R layer.—Consolidated bedrock beneath the soil. The bedrock commonly underlies a C horizon, but it can be directly below an A or a B horizon.

Humus. The well decomposed, more or less stable part of the organic matter in mineral soils.

Hydrologic soil groups. Refers to soils grouped according to their runoff potential.

The soil properties that influence this potential are those that affect the minimum rate of water infiltration on a bare soil during periods after prolonged wetting when the soil is not frozen. These properties are depth to a seasonal high water table, the infiltration rate and permeability after prolonged wetting, and depth to a very slowly permeable layer. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff.

Igneous rock. Rock that was formed by cooling and solidification of magma and that has not been changed appreciably by weathering since its formation. Major varieties include plutonic and volcanic rock (e.g., andesite, basalt, and granite).

Illuviation. The movement of soil material from one horizon to another in the soil profile. Generally, material is removed from an upper horizon and deposited in a lower horizon.

Impervious soil. A soil through which water, air, or roots penetrate slowly or not at all. No soil is absolutely impervious to air and water all the time.

Increasers. Species in the climax vegetation that increase in amount as the more desirable plants are reduced by close grazing. Increasers commonly are the shorter plants and the less palatable to livestock.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration capacity. The maximum rate at which water can infiltrate into a soil under a given set of conditions.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Intake rate. The average rate of water entering the soil under irrigation. Most soils have a fast initial rate; the rate decreases with application time. Therefore, intake rate for design purposes is not a constant but is a variable depending on the net irrigation application. The rate of water intake, in inches per hour, is expressed as follows:

Less than 0.2	very low
0.2 to 0.4	low
0.4 to 0.75	moderately low
0.75 to 1.25	moderate
1.25 to 1.75	moderately high
1.75 to 2.5	high
More than 2.5	very high

Interfluve. A landform composed of the relatively undissected upland or ridge between two adjacent valleys containing streams flowing in the same general direction. An elevated area between two drainageways that sheds water to those drainageways.

Interfluve (geomorphology). A geomorphic component of hills consisting of the uppermost, comparatively level or gently sloping area of a hill; shoulders of backwearing hillslopes can narrow the upland or can merge, resulting in a strongly convex shape.

Intermittent stream. A stream, or reach of a stream, that does not flow year-round but that is commonly dry for 3 or more months out of 12 and whose channel is generally below the local water table. It flows only during wet periods or when it receives ground-water discharge or long, continued contributions from melting snow or other surface and shallow subsurface sources.

Internal soil drainage. The downward movement of water through the soil profile. The rate of movement is determined by the texture, structure, and other

characteristics of the soil profile and underlying layers and by the height of the water table, either permanent or perched. Relative terms for expressing internal drainage are *none*, *very slow*, *slow*, *medium*, *rapid*, and *very rapid*.

Invaders. On range, plants that encroach into an area and grow after the climax vegetation has been reduced by grazing. Generally, plants invade following disturbance of the surface.

Iron depletions. See Redoximorphic features.

Irrigation. Application of water to soils to assist in production of crops. Methods of irrigation are:

Basin.—Water is applied rapidly to nearly level plains surrounded by levees or dikes.

Border.—Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.

Controlled flooding.—Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.

Drip (or trickle).—Water is applied slowly and under low pressure to the surface of the soil or into the soil through such applicators as emitters, porous tubing, or perforated pipe.

Furrow.—Water is applied in small ditches made by cultivation implements.

Furrows are used for tree and row crops.

Sprinkler.—Water is sprayed over the soil surface through pipes or nozzles from a pressure system.

Subirrigation.—Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.

Karst (topography). A kind of topography that formed in limestone, gypsum, or other soluble rocks by dissolution and that is characterized by closed depressions, sinkholes, caves, and underground drainage.

Knoll. A small, low, rounded hill rising above adjacent landforms.

K_{sat}. Saturated hydraulic conductivity. (See Permeability.)

Lacustrine deposit. Material deposited in lake water and exposed when the water level is lowered or the elevation of the land is raised.

Lake plain. A nearly level surface marking the floor of an extinct lake filled by well sorted, generally fine textured, stratified deposits, commonly containing varves.

Lamellae. Thin bands of fibers of translocated clay that constitute illuvial, and in many cases argillic, horizons in sandy upland soils.

Landslide. A general, encompassing term for most types of mass movement landforms and processes involving the downslope transport and outward deposition of soil and rock materials caused by gravitational forces; the movement may or may not involve saturated materials. The speed and distance of movement, as well as the amount of soil and rock material, vary greatly.

Leaching. The removal of soluble material from soil or other material by percolating water.

Linear extensibility. Refers to the change in length of an unconfined clod as moisture content is decreased from a moist to a dry state. Linear extensibility is used to determine the shrink-swell potential of soils. It is an expression of the volume change between the water content of the clod at $1/3$ - or $1/10$ -bar tension (33kPa or 10kPa tension) and oven dryness. Volume change is influenced by the amount and type of clay minerals in the soil. The volume change is the percent change for the whole soil. If it is expressed as a fraction, the resulting value is COLE, coefficient of linear extensibility.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Loess. Material transported and deposited by wind and consisting dominantly of silt-sized particles.

Low strength. The soil is not strong enough to support loads.

Low-residue crops. Such crops as corn used for silage, peas, beans, and potatoes. Residue from these crops is not adequate to control erosion until the next crop in the rotation is established. These crops return little organic matter to the soil.

Map unit. Any soil, miscellaneous land type, soil complex, or undifferentiated soil group shown on a detailed soil map and identified by a symbol.

Marl. An earthy, unconsolidated deposit consisting chiefly of calcium carbonate mixed with clay in approximately equal proportions; formed primarily under freshwater lacustrine conditions but also formed in more saline environments.

Mass movement. A generic term for the dislodgment and downslope transport of soil and rock material as a unit under direct gravitational stress.

Masses. See Redoximorphic features.

Meander belt. The zone within which migration of a meandering channel occurs; the flood-plain area included between two imaginary lines drawn tangential to the outer bends of active channel loops.

Mechanical treatment. Use of mechanical equipment for seeding, brush management, and other management practices.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Mesa. A broad, nearly flat topped and commonly isolated landmass bounded by steep slopes or precipitous cliffs and capped by layers of resistant, nearly horizontal rocky material. The summit width is characteristically greater than the height of the bounding escarpments.

Metamorphic rock. Rock of any origin altered in mineralogical composition, chemical composition, or structure by heat, pressure, and movement at depth in the earth's crust. Nearly all such rocks are crystalline.

Mine spoil. An accumulation of displaced earthy material, rock, or other waste material removed during mining or excavation. Also called earthy fill.

Mineral soil. Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Miscellaneous area. A kind of map unit that has little or no natural soil and supports little or no vegetation.

Miscellaneous land type. A map unit consisting of areas of land that have little or no natural soil, that are too nearly inaccessible for orderly examination, or that occur where, for other reasons, it is not feasible to classify the soil.

Moderately coarse textured soil. Coarse sandy loam, sandy loam, or fine sandy loam.

Moderately fine textured soil. Clay loam, sandy clay loam, or silty clay loam.

Mollie epipedon. A thick, dark, humus-rich surface horizon (or horizons) that has high base saturation and pedogenic soil structure. It may include the upper part of the subsoil.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Irregular spots of different colors that vary in number and size. Descriptive terms are as follows: abundance—*few, common, and many*; size—*fine, medium, and coarse*; and contrast—*faint, distinct, and prominent*. The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium*, from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse*, more than 15 millimeters (about 0.6 inch).

Mountain. A generic term for an elevated area of the land surface, rising more than 1,000 feet (300 meters) above surrounding lowlands, commonly of restricted summit area (relative to a plateau) and generally having steep sides. A mountain can occur as a single, isolated mass or in a group forming a chain or range. Mountains are formed primarily by tectonic activity and/or volcanic action but can also be formed by differential erosion.

Mudstone. A blocky or massive, fine grained sedimentary rock in which the proportions of clay and silt are approximately equal. Also, a general term for such material as clay, silt, claystone, siltstone, shale, and argillite and that should be used only when the amounts of clay and silt are not known or cannot be precisely identified.

Munsell notation. A designation of color by degrees of three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color with hue of 10YR, value of 6, and chroma of 4.

Natric horizon. A special kind of argillic horizon that contains enough exchangeable sodium to have an adverse effect on the physical condition of the subsoil.

Natural drainage. Refers to conditions that existed during the development of a soil, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven different classes of natural drainage are recognized.

Neutral soil. A soil having a pH value of 6.6 to 7.3. (See Reaction, soil.)

Nodules. See Redoximorphic features.

Nose slope (geomorphology). A geomorphic component of hills consisting of the projecting end (laterally convex area) of a hillside. The overland waterflow is predominantly divergent. Nose slopes consist dominantly of colluvium and slope-wash sediments (for example, slope alluvium).

Nutrient, plant. Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Open space. A relatively undeveloped green or wooded area provided mainly within an urban area to minimize feelings of congested living.

Organic matter. Plant and animal residue in the soil in various stages of decomposition. The content of organic matter in the surface layer is described as follows:

Very low	less than 0.5 percent
Low	0.5 to 1.0 percent
Moderately low	1.0 to 2.0 percent
Moderate	2.0 to 4.0 percent
High	4.0 to 8.0 percent
Very high	more than 8.0 percent

Paleoterrace. An erosional remnant of a terrace that retains the surface form and alluvial deposits of its origin but was not emplaced by, and commonly does not grade to, a present-day stream or drainage network.

Pan. A compact, dense layer in a soil that impedes the movement of water and the growth of roots. For example, *hardpan*, *fragipan*, *claypan*, *plowpan*, and *traffic pan*.

Parent material. The unconsolidated organic and mineral material in which soil forms.

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedisediment. A layer of sediment, eroded from the shoulder and backslope of an erosional slope, that lies on and is being (or was) transported across a gently sloping erosional surface at the foot of a receding hill or mountain slope.

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percolation. The movement of water through the soil.

Permeability. The quality of the soil that enables water or air to move downward through the profile. The rate at which a saturated soil transmits water is accepted as a measure of this quality. In soil physics, the rate is referred to as "saturated hydraulic conductivity," which is defined in the "Soil Survey Manual." In line with conventional usage in the engineering profession and with traditional usage in published soil surveys, this rate of flow continues to be expressed as "permeability." Terms describing permeability, measured in inches per hour, are as follows:

Impermeable	less than 0.0015 inch
Very slow	0.0015 to 0.06 inch
Slow	0.06 to 0.2 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Phase, soil. A subdivision of a soil series based on features that affect its use and management, such as slope, stoniness, and flooding.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plateau (geomorphology). A comparatively flat area of great extent and elevation; specifically, an extensive land region that is considerably elevated (more than 100 meters) above the adjacent lower lying terrain, is commonly limited on at least one side by an abrupt descent, and has a flat or nearly level surface. A comparatively large part of a plateau surface is near summit level.

Playa. The generally dry and nearly level lake plain that occupies the lowest parts of closed depressions, such as those on intermontane basin floors. Temporary flooding occurs primarily in response to precipitation and runoff. Playa deposits are fine grained and may or may not have a high water table and saline conditions.

Plinthite. The sesquioxide-rich, humus-poor, highly weathered mixture of clay with quartz and other diluents. It commonly appears as red mottles, usually in platy, polygonal, or reticulate patterns. Plinthite changes irreversibly to an ironstone hardpan or to irregular aggregates on repeated wetting and drying, especially if it is exposed also to heat from the sun. In a moist soil, plinthite can be cut with a spade. It is a form of laterite.

Plowpan. A compacted layer formed in the soil directly below the plowed layer.

Ponding. Standing water on soils in closed depressions. Unless the soils are artificially drained, the water can be removed only by percolation or evapotranspiration.

Poorly graded. Refers to a coarse grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

Pore linings. See Redoximorphic features.

Potential native plant community. See Climax plant community.

Potential rooting depth (effective rooting depth). Depth to which roots could penetrate if the content of moisture in the soil were adequate. The soil has no properties restricting the penetration of roots to this depth.

Prescribed burning. Deliberately burning an area for specific management purposes, under the appropriate conditions of weather and soil moisture and at the proper time of day.

Productivity, soil. The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Proper grazing use. Grazing at an intensity that maintains enough cover to protect the soil and maintain or improve the quantity and quality of the desirable vegetation. This practice increases the vigor and reproduction capacity of the key plants and promotes the accumulation of litter and mulch necessary to conserve soil and water.

Rangeland. Land on which the potential natural vegetation is predominantly grasses, grasslike plants, forbs, or shrubs suitable for grazing or browsing. It includes natural grasslands, savannas, many wetlands, some deserts, tundras, and areas that support certain forb and shrub communities.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed as pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degrees of acidity or alkalinity, expressed as pH values, are:

Ultra acid	less than 3.5
Extremely acid	3.5 to 4.4
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Moderately acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Slightly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Red beds. Sedimentary strata that are mainly red and are made up largely of sandstone and shale.

Redoximorphic concentrations. See Redoximorphic features.

Redoximorphic depletions. See Redoximorphic features.

Redoximorphic features. Redoximorphic features are associated with wetness and result from alternating periods of reduction and oxidation of iron and manganese compounds in the soil. Reduction occurs during saturation with water, and oxidation occurs when the soil is not saturated. Characteristic color patterns are created by these processes. The reduced iron and manganese ions may be removed from a soil if vertical or lateral fluxes of water occur, in which case there is no iron or manganese precipitation in that soil. Wherever the iron and manganese are oxidized and precipitated, they form either soft masses or hard concretions or nodules. Movement of iron and manganese as a result of redoximorphic processes in a soil may result in redoximorphic features that are defined as follows:

1. Redoximorphic concentrations.—These are zones of apparent accumulation of iron-manganese oxides, including:
 - A. Nodules and concretions, which are cemented bodies that can be removed from the soil intact. Concretions are distinguished from nodules on

the basis of internal organization. A concretion typically has concentric layers that are visible to the naked eye. Nodules do not have visible organized internal structure; *and*

- B. Masses, which are noncemented concentrations of substances within the soil matrix; *and*
- C. Pore linings, i.e., zones of accumulation along pores that may be either coatings on pore surfaces or impregnations from the matrix adjacent to the pores.

2. Redoximorphic depletions.—These are zones of low chroma (chromas less than those in the matrix) where either iron-manganese oxides alone or both iron-manganese oxides and clay have been stripped out, including:
 - A. Iron depletions, i.e., zones that contain low amounts of iron and manganese oxides but have a clay content similar to that of the adjacent matrix; *and*
 - B. Clay depletions, i.e., zones that contain low amounts of iron, manganese, and clay (often referred to as silt coatings or skeletans).
3. Reduced matrix.—This is a soil matrix that has low chroma *in situ* but undergoes a change in hue or chroma within 30 minutes after the soil material has been exposed to air.

Reduced matrix. See Redoximorphic features.

Regolith. All unconsolidated earth materials above the solid bedrock. It includes material weathered in place from all kinds of bedrock and alluvial, glacial, eolian, lacustrine, and pyroclastic deposits.

Relief. The relative difference in elevation between the upland summits and the lowlands or valleys of a given region.

Residuum (residual soil material). Unconsolidated, weathered or partly weathered mineral material that accumulated as bedrock disintegrated in place.

Rill. A very small, steep-sided channel resulting from erosion and cut in unconsolidated materials by concentrated but intermittent flow of water. A rill generally is not an obstacle to wheeled vehicles and is shallow enough to be smoothed over by ordinary tillage.

Rippable. Rippable bedrock or hardpan can be excavated using a single-tooth ripping attachment mounted on a tractor with a 200–300 drawbar horsepower rating.

Riser. The vertical or steep side slope (e.g., escarpment) of terraces, flood-plain steps, or other stepped landforms; commonly a recurring part of a series of natural, steplike landforms, such as successive stream terraces.

Road cut. A sloping surface produced by mechanical means during road construction. It is commonly on the uphill side of the road.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Root zone. The part of the soil that can be penetrated by plant roots.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Saline soil. A soil containing soluble salts in an amount that impairs growth of plants. A saline soil does not contain excess exchangeable sodium.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandstone. Sedimentary rock containing dominantly sand-sized particles.

Saturated hydraulic conductivity (K_{sat}). See Permeability.

Saturation. Wetness characterized by zero or positive pressure of the soil water.

Under conditions of saturation, the water will flow from the soil matrix into an unlined auger hole.

Scarification. The act of abrading, scratching, loosening, crushing, or modifying the surface to increase water absorption or to provide a more tillable soil.

Sedimentary rock. A consolidated deposit of clastic particles, chemical precipitates, or organic remains accumulated at or near the surface of the earth under normal low temperature and pressure conditions. Sedimentary rocks include consolidated equivalents of alluvium, colluvium, drift, and eolian, lacustrine, and marine deposits. Examples are sandstone, siltstone, mudstone, claystone, shale, conglomerate, limestone, dolomite, and coal.

Sequum. A sequence consisting of an illuvial horizon and the overlying eluvial horizon. (See Eluviation.)

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Shale. Sedimentary rock that formed by the hardening of a deposit of clay, silty clay, or silty clay loam and that has a tendency to split into thin layers.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and surface runoff.

Shoulder. The convex, erosional surface near the top of a hillslope. A shoulder is a transition from summit to backslope.

Shrub-coppice dune. A small, streamlined dune that forms around brush and clump vegetation.

Side slope (geomorphology). A geomorphic component of hills consisting of a laterally planar area of a hillside. The overland waterflow is predominantly parallel. Side slopes are dominantly colluvium and slope-wash sediments.

Silica. A combination of silicon and oxygen. The mineral form is called quartz.

Silica-sesquioxide ratio. The ratio of the number of molecules of silica to the number of molecules of alumina and iron oxide. The more highly weathered soils or their clay fractions in warm-temperate, humid regions, and especially those in the tropics, generally have a low ratio.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Siltstone. An indurated silt having the texture and composition of shale but lacking its fine lamination or fissility; a massive mudstone in which silt predominates over clay.

Similar soils. Soils that share limits of diagnostic criteria, behave and perform in a similar manner, and have similar conservation needs or management requirements for the major land uses in the survey area.

Sinkhole. A closed, circular or elliptical depression, commonly funnel shaped, characterized by subsurface drainage and formed either by dissolution of the surface of underlying bedrock (e.g., limestone, gypsum, or salt) or by collapse of underlying caves within bedrock. Complexes of sinkholes in carbonate-rock terrain are the main components of karst topography.

Similarity index. The present composition of the plant community on an ecological site in relation to the potential natural plant community for that site. Similarity index is expressed as *excellent, good, fair, or poor*, on the basis of how much the present plant community has departed from the potential.

Site index. A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75.

Slickensides (pedogenic). Grooved, striated, and/or glossy (shiny) slip faces on structural peds, such as wedges; produced by shrink-swell processes, most commonly in soils that have a high content of expansive clays.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance. In this survey, classes for simple slopes are as follows:

Nearly level	0 to 1 percent
Very gently sloping	1 to 3 percent
Gently sloping	3 to 5 percent
Moderately sloping	5 to 8 percent
Strongly sloping	8 to 12 percent
Moderately steep	12 to 20 percent
Steep	20 to 45 percent
Very steep	45 percent and higher

Classes for complex slopes are as follows:

Nearly level	0 to 3 percent
Gently undulating	1 to 5 percent
Undulating	1 to 8 percent
Gently rolling	5 to 12 percent
Rolling	5 to 15 percent
Hilly	8 to 30 percent
Steep	20 to 45 percent
Very steep	45 percent and higher

Slope alluvium. Sediment gradually transported down the slopes of mountains or hills primarily by nonchannel alluvial processes (i.e., slope-wash processes) and characterized by particle sorting. Lateral particle sorting is evident on long slopes. In a profile sequence, sediments may be distinguished by differences in size and/or specific gravity of rock fragments and may be separated by stone lines. Burnished peds and sorting of rounded or subrounded pebbles or cobbles distinguish these materials from unsorted colluvial deposits.

Sodic (alkali) soil. A soil having so high a degree of alkalinity (pH 8.5 or higher) or so high a percentage of exchangeable sodium (15 percent or more of the total exchangeable bases), or both, that plant growth is restricted.

Sodicity. The degree to which a soil is affected by exchangeable sodium. Sodicity is expressed as a sodium adsorption ratio (SAR) of a saturation extract, or the ratio of Na^+ to $\text{Ca}^{++} + \text{Mg}^{++}$. The degrees of sodicity and their respective ratios are:

Slight	less than 13:1
Moderate	13-30:1
Strong	more than 30:1

Sodium adsorption ratio (SAR). A measure of the amount of sodium (Na) relative to calcium (Ca) and magnesium (Mg) in the water extract from saturated soil paste. It is the ratio of the Na concentration divided by the square root of one-half of the Ca + Mg concentration.

Soft bedrock. Bedrock that can be excavated with trenching machines, backhoes, small rippers, and other equipment commonly used in construction.

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief and by the passage of time.

Soil separates. Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes, in millimeters, of separates recognized in the United States are as follows:

Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	less than 0.002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A, E, and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the material below the solum. The living roots and plant and animal activities are largely confined to the solum.

Stone line. In a vertical cross section, a line formed by scattered fragments or a discrete layer of angular and subangular rock fragments (commonly a gravel- or cobble-sized lag concentration) that formerly was draped across a topographic surface and was later buried by additional sediments. A stone line generally caps material that was subject to weathering, soil formation, and erosion before burial. Many stone lines seem to be buried erosion pavements, originally formed by sheet and rill erosion across the land surface.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter if rounded or 15 to 24 inches (38 to 60 centimeters) in length if flat.

Stony. Refers to a soil containing stones in numbers that interfere with or prevent tillage.

Strath terrace. A type of stream terrace; formed as an erosional surface cut on bedrock and thinly mantled with stream deposits (alluvium).

Stream terrace. One of a series of platforms in a stream valley, flanking and more or less parallel to the stream channel, originally formed near the level of the stream; represents the remnants of an abandoned flood plain, stream bed, or valley floor produced during a former state of fluvial erosion or deposition.

Stripcropping. Growing crops in a systematic arrangement of strips or bands that provide vegetative barriers to wind erosion and water erosion.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grained* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Stubble mulch. Stubble or other crop residue left on the soil or partly worked into the soil. It protects the soil from wind erosion and water erosion after harvest, during preparation of a seedbed for the next crop, and during the early growing period of the new crop.

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Subsoiling. Tilling a soil below normal plow depth, ordinarily to shatter a hardpan or claypan.

Substratum. The part of the soil below the solum.

Subsurface layer. Any surface soil horizon (A, E, AB, or EB) below the surface layer.

Summer fallow. The tillage of uncropped land during the summer to control weeds and allow storage of moisture in the soil for the growth of a later crop. A practice common in semiarid regions, where annual precipitation is not enough to produce

a crop every year. Summer fallow is frequently practiced before planting winter grain.

Summit. The topographically highest position of a hillslope. It has a nearly level (planar or only slightly convex) surface.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Surface soil. The A, E, AB, and EB horizons, considered collectively. It includes all subdivisions of these horizons.

Talus. Rock fragments of any size or shape (commonly coarse and angular) derived from and lying at the base of a cliff or very steep rock slope. The accumulated mass of such loose broken rock formed chiefly by falling, rolling, or sliding.

Taxadjuncts. Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use and behavior. Soils are recognized as taxadjuncts only when one or more of their characteristics are slightly outside the range defined for the family of the series for which the soils are named.

Terrace (conservation). An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet. A terrace in a field generally is built so that the field can be farmed. A terrace intended mainly for drainage has a deep channel that is maintained in permanent sod.

Terrace (geomorphology). A steplike surface, bordering a valley floor or shoreline, that represents the former position of a flood plain, lake, or seashore. The term is usually applied both to the relatively flat summit surface (tread) that was cut or built by stream or wave action and to the steeper descending slope (scarp or riser) that has graded to a lower base level of erosion.

Terracettes. Small, irregular steplike forms on steep hillslopes, especially in pasture, formed by creep or erosion of surficial materials that may be induced or enhanced by trampling of livestock, such as sheep or cattle.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand*, *loamy sand*, *sandy loam*, *loam*, *silt loam*, *silt*, *sandy clay loam*, *clay loam*, *silty clay loam*, *sandy clay*, *silty clay*, and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Toeslope. The gently inclined surface at the base of a hillslope. Toeslopes in profile are commonly gentle and linear and are constructional surfaces forming the lower part of a hillslope continuum that grades to valley or closed-depression floors.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Trace elements. Chemical elements, for example, zinc, cobalt, manganese, copper, and iron, in soils in extremely small amounts. They are essential to plant growth.

Tread. The flat to gently sloping, topmost, laterally extensive slope of terraces, floodplain steps, or other stepped landforms; commonly a recurring part of a series of natural steplike landforms, such as successive stream terraces.

Upland. An informal, general term for the higher ground of a region, in contrast with a low-lying adjacent area, such as a valley or plain, or for land at a higher elevation

than the flood plain or low stream terrace; land above the footslope zone of the hillslope continuum.

Valley fill. The unconsolidated sediment deposited by any agent (water, wind, ice, or mass wasting) so as to fill or partly fill a valley.

Variant, soil. A soil having properties sufficiently different from those of other known soils to justify a new series name, but occurring in such a limited geographic area that creation of a new series is not justified.

Variegation. Refers to patterns of contrasting colors assumed to be inherited from the parent material rather than to be the result of poor drainage.

Water-holding capacity. See Available water capacity.

Weathering. All physical disintegration, chemical decomposition, and biologically induced changes in rocks or other deposits at or near the earth's surface by atmospheric or biologic agents or by circulating surface waters but involving essentially no transport of the altered material.

Well graded. Refers to soil material consisting of coarse grained particles that are well distributed over a wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

Wilting point (or permanent wilting point). The moisture content of soil, on an oven-dry basis, at which a plant (specifically a sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

Windthrow. The uprooting and tipping over of trees by the wind.

Winnowing. The removal of clay and silt particles from the soil by strong winds. The coarser particles remain, and the soil becomes sandier and more highly erodible as the process continues.

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